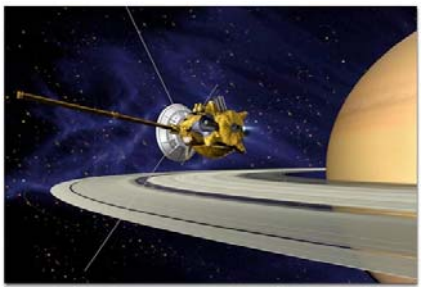


CASSINI–HUYGENS

# PUBLIC ENGAGEMENT PLAN

OCTOBER 2003

JPL D-21575

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

*Foreword*

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science." —Albert Einstein

As ancient mariners, we charted our journeys and our destinies by the stars in the night sky. Their cosmic mysteries have drawn us all, from the icy fjords of Norway to the wheat fields of the North American plains. Today, an international collaboration of countries has pointed a collective compass toward Saturn, seeking to understand its nature, its history, its rings and its moons, by guiding the Cassini spacecraft in a first-ever orbital exploration and by launching the Huygens probe into the cosmic realm of Titan.

All across the world we seek to make this jewel of the solar system a part of our shared human experience, to inspire the next generation of explorers.

Our goal: A multinational effort to create a shared human experience.

*The Cassini–Huygens Public Engagement Team*

## *Contents*

# 1. INTRODUCTION

## 1a. Executive Summary

The rings of Saturn have puzzled and intrigued astronomers ever since Galileo discovered them in 1610, using one of the earliest telescopes. First-time observers of the planet still step back from their telescopes speechless.

"After all this time we're still not sure about the origin of Saturn's rings," says Jeff Cuzzi, a planetary scientist at NASA's Ames Research Center. Dr. Cuzzi is part of an international team that will study Cassini–Huygens data about Saturn's rings. The Cassini–Huygens public engagement program will focus on these rings, which make Saturn the jewel of the solar system. A Saturn observation campaign will inspire children around the world and provide opportunities for educators to use NASA's unique teaching tools. We will exploit the excitement of the Cassini–Huygens mission to create new ways of getting science into the classroom, especially to the very young student, for whom the love of science most needs to be fostered and encouraged. As the results of the mission come streaming to Earth, we will enable kids throughout the world to share in the exhilarating experience of discovery.

### Principles for Public Engagement

The principles for public engagement crosscut all Education and Public Outreach (E/PO) objectives and are critical and inseparable for successful implementation of this plan. They include:

- *Involving our scientific research community*. There are approximately 270 Cassini–Huygens research scientists associated with the Cassini and Huygens investigations in the United States and Europe. We have identified suitable tasks for scientist involvement in this important effort. The scientists provide credibility and a wide range of expertise, and there are ample opportunities for their participation.
- *Enhancing the breadth and effectiveness of partnerships*. The Public Engagement Plan will:
  — Focus on high-leverage opportunities;
  — Build on existing programs, institutions and infrastructure;
  — Emphasize collaboration with planetariums and science museums; and
  — Coordinate with other ongoing education and outreach efforts inside NASA and other government agencies.
- *Using existing programs*. Because this plan is being developed during a fully operating planetary exploration mission, a key principle will be to incorporate successful elements from the earliest part of the mission through its completion. We will also look for programs from other space exploration missions (e.g., New Millennium Program, Navigator public engagement, and Mars public engagement) with synergistic themes and concepts.
- *One program, catering to multiple audiences*. We will develop programs that can be used in multiple ways with multiple audiences.

- *Bringing science and the Saturn experience to many different groups in all that we do*. Diversity is an essential element of every activity throughout this plan. Cassini–Huygens public engagement will strive to reach the greatest possible number of people through partnerships with youth groups, and informal education outreach to libraries, the visually challenged, and programs that have demonstrated cross-disciplinary methods to reach diverse populations. We will provide a balanced portfolio of national programs, regional efforts, and specific targeted campaigns. The educational products and activities developed by Cassini–Huygens public engagement and the NASA Office of Education will seek to enhance the quality of mathematics, science, and technology education for all with Internet-based and hard-copy materials disseminated through the Office of Space Science network.
- *Reaching out through the media and other public venues*. The scientific study of the Saturn system will be publicized as widely as possible, targeting the needs and interests of the media and taking full advntage of the Internet and its wide accessibility to millions of people.
- *Evaluating effectiveness and leaving a legacy of reusable outreach methodology*. We will evaluate our Public Engagement Plan for quality, impact, and effectiveness, including what we have accomplished and what others may find useful now and in the future. We will expand the scope of our public engagement program by making the components of the program suitable for replication in future missions.

These public engagement principles align with NASA's new education criteria, which include:

1) Providing educators with unique teaching tools and compelling experiences;

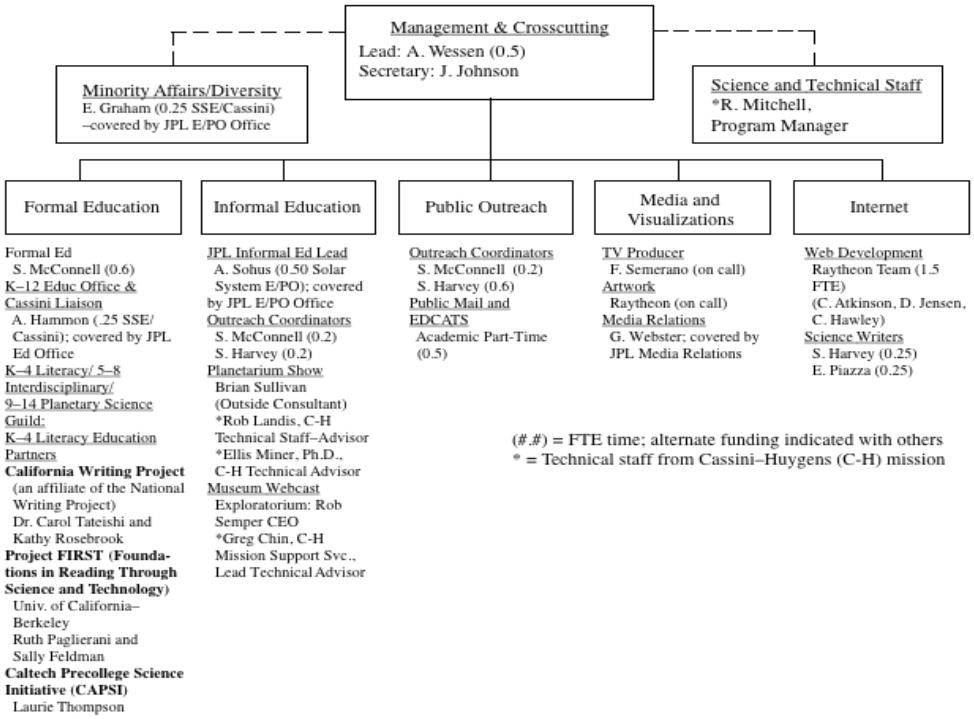
2) Motivating K–16+ students to pursue careers in science, math, engineering, and technology;

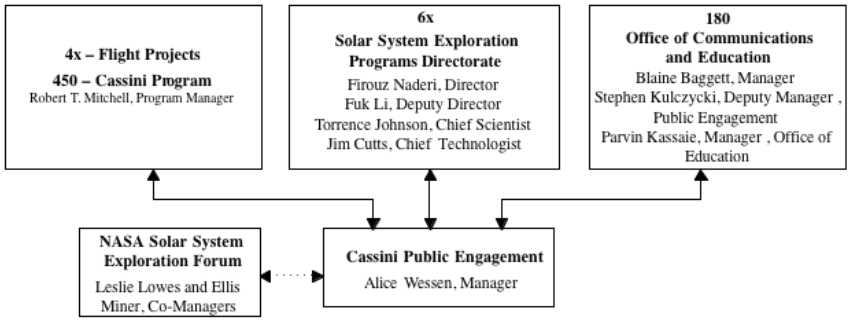
3) Engaging minority and underrepresented students, educators, researchers, and institutions in NASA research and education programs; and

4) Effective and efficient use of taxpayer funds.

The following two figures illustrate the structure of Cassini public engagement and how the organization relates to the larger JPL and NASA organizations.

## *Cassini Public Engagement Structure*



## 1b. International Mission to Saturn and Titan

The Cassini–Huygens mission was named in honor of two European astronomers who pioneered modern observation of Saturn. The Titan probe is named for Christiaan Huygens, who discovered the satellite in 1655 and developed the concept of the ring system in 1659. The orbiter is named for Jean-Dominique Cassini who, in 1671–1684, discovered the ring feature later named for him (the Cassini Division) as well as the moons Iapetus, Rhea, Dione, and Tethys.

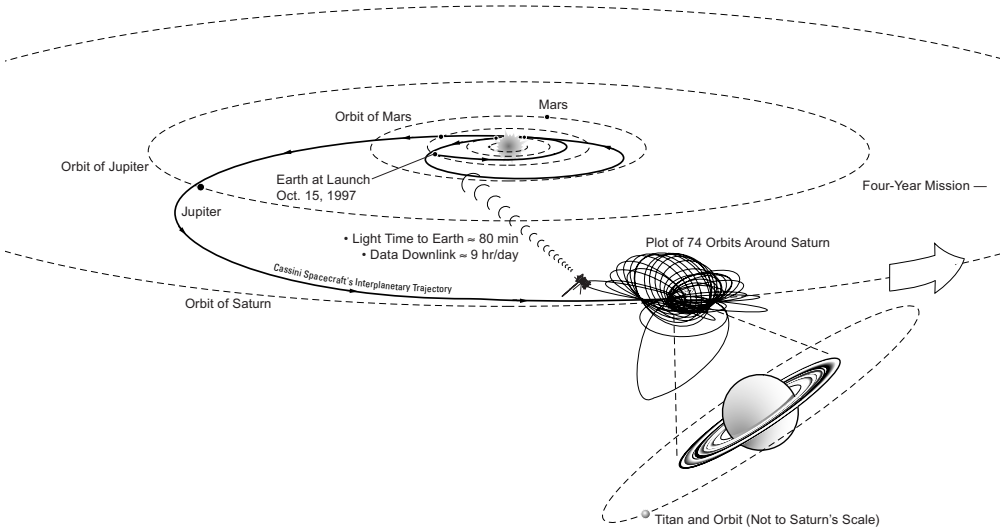
Today our study of Saturn continues as an international endeavor. Seventeen countries are participating in the Cassini–Huygens mission of discovery. The four-year orbital tour will be one of the most complicated planetary exploration missions ever undertaken, and we anticipate that there will be many surprises. The spacecraft will carry out an extensive study of the planet's atmosphere, magnetic field, and rings, the satellite Titan, and a number of the smaller icy moons. Titan, Saturn's largest satellite, is the target of the Huygens instrumented probe.

The mission is a joint endeavor of the National Aeronautics and Space Administration (NASA), which provided the orbiter, and the European Space Agency (ESA), which supplied the Huygens probe. The Italian space agency (Agenzia Spaziale Italiana, or ASI) contributed hardware systems for the orbiter spacecraft and instruments. Other instruments on the orbiter and probe were provided by scientific groups and/or their industrial partners, with the support of NASA or national funding agencies of ESA member states. NASA furnished the launch vehicle and launch operations. NASA provides mission operations and telecommunications via its Deep Space Network (DSN), and ESA carries out Huygens operations from its center in Darmstadt, Germany.

### The Mission Timeline

Cassini–Huygens' interplanetary journey began in October 1997 with its launch from Cape Canaveral Air Force Station in Florida. The spacecraft's trajectory used planetary gravity assists from Venus (twice), Earth, and Jupiter. When it arrives at Saturn in July 2004, Cassini–Huygens will go into orbit around the planet. (See trajectory diagram, next page.) The spacecraft's arrival at Saturn is timed for optimum viewing of the spectacular rings during a period when they will be well-illuminated by sunlight. The tilt of the ring plane and the illumination angle will allow an unsurpassed view of the ring disk. During its four-year tour, Cassini will look for "moonlets" inside the rings, study the composition of the ring particles, and observe ring dynamics and how Saturn's magnetic field interacts with the ring system. The orbiter releases the Huygens probe on December 25, 2004 for a January 14, 2005 arrival at Titan. After using its heat shield for deceleration in the upper atmosphere, the probe will deploy a parachute and slowly fall to the surface. The approximately 2-1/2-hour descent will provide a challenging opportunity for the probe's six instruments to observe and measure the atmosphere. The Huygens probe data will be transmitted to the orbiter and then to Earth, after which the orbiter commences its tour of the Saturn system. With its complement of 12 instruments, the versatile Cassini spacecraft is capable of making a wide range of *in situ* and remote-sensing observations. Forty-four close flybys of Titan and studies of Saturn's icy satellites are planned throughout the tour. A Cassini instrument designed by the Applied Physics Laboratory at Johns Hopkins University will provide the first-ever images of the planet's magnetic field, which will open a new observational window and significantly enhance planetary studies. We'll see images of the plasma and radiation surrounding Saturn and enveloping its satellites, including mysterious Titan.

## *Cassini–Huygens Trajectory*



## 1c. Management Approach: Vision, Goals, Objectives

### Vision

***The Cassini–Huygens mission has an overarching vision guiding its public engagement goals: an international effort towards a shared human experience.*** To support this vision, we will seek opportunities to reach out broadly, using multifaceted methods to reach diverse populations and create opportunities for personal, meaningful connections. While Cassini–Huygens is a uniquely international mission, we recognize that the most meaningful experiences tend to happen in the comfort and familiarity of neighborhood settings. Therefore, we will partner with schools, museums, youth groups, and other environments where people have a sense of community.

### Goals

To achieve the vision, all Cassini–Huygens public engagement activities will be selected and managed with the following goals in mind:

GOAL 1

Communicate the story of Saturnian exploration in a way that builds on enduring themes to foster a shared human experience.

GOAL 2

Create the means for immersive, meaningful, and personal public involvement in the exploration of the Saturn system.

GOAL 3

Invite everyone to participate in the exciting exploration of the Saturnian system, ensuring that our programs enhance science, mathematics, and technology education equitably for diverse populations.

### Objectives

Objectives supporting these goals include:

OBJECTIVE 1

Integrate Cassini–Huygens science with other areas of knowledge (art, music, literature, etc.) to create a richer, deeper, learning experience that will broaden children's education and enhance the personal experience the mission hopes to achieve.

OBJECTIVE 2

Support the development of activities and immersive experiences in classrooms, museums, youth groups, and other neighborhood settings.

OBJECTIVE 3

Build strong partnerships, in cooperation with Cassini–Huygens' technical and scientific staff, with interested individuals in education, museum, diversity, youth groups, and others to bring the discoveries of the Cassini–Huygens mission to a broad audience. We will use the Internet to disseminate information widely, and utilize our partners to make connections with communities across America.

## 2. CORE ELEMENTS OF CASSINI–HUYGENS PUBLIC ENGAGEMENT

### 2a. Themes and Standards

#### Background

A primitive telescope and a fascination with star-gazing spurred the curiosity of the namesake for the Cassini mission — Jean-Dominique Cassini (1625–1712). Mentoring and tutelage from the scientists of his day provided the foundation for Cassini's interest in the heavens. While "looking through the tube," he studied the Moon, Mars, Saturn, Jupiter, comets, and the orbits of planets and satellites. As he observed Saturn, Cassini discovered the satellites Iapetus, Rhea, Tethys, and Dione. In 1675, he discovered that Saturn's rings are split largely into two parts by a narrow gap — known since as the Cassini Division.

Another astute Saturn observer, the Dutch astronomer Christiaan Huygens (1629–1695), had proposed in 1655 that Saturn had a flat ring around its equator. That same year, Huygens discovered Saturn's largest satellite, which would be named Titan 200 years later. The Huygens probe now traveling to Saturn aboard the Cassini spacecraft will parachute to the surface of Titan in 2005.

Huygens' family had a strong devotion to education in multiple fields — the sciences, literature, and music. Huygens' interdisciplinary education further benefited from the influence of mentor scientists, including Descartes.

#### Themes that Link Programs Together

The heart of the Cassini–Huygens Public Engagement Plan is the vision of a shared human experience through storytelling and writing, scientist involvement, and giving the public an opportunity to "look through the tube" at Saturn. The Formal Education portion of this plan will link the scientific principles of the mission to National Science Education Standards, and use those standards in the application of activities that enhance classroom learning and teacher preparation.

The overarching vision for Cassini–Huygens public engagement is "a shared human experience," with real, experiential, immersive opportunities created for the public. Everyone will be invited to participate in the exciting exploration of the Saturn system. Creative methods to reach diverse audiences will engage everyone in this exciting process.

We have established three major theme categories: ***The Destination***, ***The Exploration***, and ***The Mission***. The main components of these themes are linked to programs, activities, and products throughout the mission.

**THE DESTINATION**

• *Saturn and Its Rings: The Jewel of the Solar System*
Concepts — Saturn is an icon; it is the symbol of astronomy to many people, and its familiarity appeals to a wide variety of cultures. Saturn is an enchanting planet — a beautiful, majestic, fascinating sight. Just looking at Saturn through a telescope is intriguing, and tends to stimulate

people into wanting to know more about it and the planets in general. Saturn's beauty also provides a connection to imagination and fantasy.

• *Titan: The Shrouded Moon*
Concepts — Saturn's moon Titan is mysterious. Shrouded in thick clouds and a hazy atmosphere, Titan makes us wonder: What does the surface look like? Are oceans present? Titan may be a key to understanding the origin and evolution of our solar system — it may offer a glimpse of the conditions and processes that formed a planet like Earth.

• *Learning the System*
Concepts — The Saturnian system is complex and has an intriguing variety of moons.

**THE EXPLORATION**

• *Technology and Robotic Exploration*
Concepts — All of us can learn from robotic exploration, promoted and explained in an accessible manner. The suite of instruments on board the Cassini–Huygens spacecraft enables us to "see through multiple eyes" as we extend the reach of our ability to observe beyond the limits of our human senses.

• *The Personal Nature of Exploration*
Concepts — Public engagement provides opportunities for a personal connection to space exploration, especially when presented in the context of a story that relates to people's own cultures and experiences. We want to take people along for the ride, make them part of the adventure: our question to them is "What do **you** think we'll discover?" We will highlight the human stories that are part of the quest to learn about Saturn.

**THE MISSION**

• *A Multinational Effort*
Concepts — Cassini–Huygens is a multinational mission: many nations are exploring another planet together. International cooperation involves many interested individuals with different skills and backgrounds. Knowledge has no geographic boundaries.

## Themes, Programs and Timelines

The public engagement theme components will be the focus of all activities. Each fiscal/school year, the development and dissemination of programs, activities, and products will be centered primarily around one or two main theme components. Initial development will take about one year; two to three years are generally needed for complete development.

The following table shows the themes keyed to the years in which activities are planned. (A more detailed table is at the beginning of Section 3, "Target Audiences and Delivery Mechanisms.") A succeeding table maps mission science to national science education standards.

***Themes Keyed to Years of Activity***

| *Theme* | *Years of Activity* |
|---|---|
| *The Destination* | |
| • Saturn and Its Rings: The Jewel of the Solar System | 2003–2004 |
| • Titan: The Shrouded Moon | 2004–2005 |
| • Learning the System | 2005–2006; 2006–2007<br>(The Saturnian System; Connection to the Solar System, Earth, and Mars) |
| *The Exploration* | |
| • Technology and Robotic Exploration | 2004–2005<br>(Seeing through Multiple Eyes; Using Technology on Earth to Access Space) |
| • The Personal Nature of Exploration | 2005–2006; 2006–2007<br>(Personal/Social/Emotional Connection; The Human Face of Exploration) |
| • Cumulative Nature of Science | 2007–2008<br>(The Cassini-Huygens Legacy; What's Next?) |
| *The Mission* | |
| • A Multinational Effort: Exploring Another Planet Together | Throughout |

***Mapping Mission Science to National Science Education Standards***

| *Cassini–Huygens Area of Interest* | *Cassini–Huygens Science Objective* | *National Science Education Standards Addressed by This Objective* |
|---|---|---|
| Saturn | Composition and temperature of atmosphere and winds | • Weather changes daily (K–4)<br>• Weather has measurable quantities such as temperature, wind and precipitation (K–4)<br>• Atmospheres are mixtures of gases and vapor (5–8)<br>• Clouds form by condensation (5–8)<br>• Patterns of atmospheric movement are global (5–8)<br>• Heating causes convection in atmospheres (9–12)<br>• Energy transfer in atmospheres causes global climate (9–12) |
| Saturn | Sources of Saturn lightning | • Electricity in circuits can produce light, heat, sound, and magnetic effects (K–4)<br>• Energy is a property of many substances (5–8)<br>• Energy is transferred in many ways (5–8)<br>• Electromagnetic waves result when a charged object is accelerated. Examples: radio waves, microwaves, infrared, ultraviolet, visible (9–12) |
| Titan | Atmospheric | • Weather changes daily (K–4) |

| *Cassini–Huygens Area of Interest* | *Cassini–Huygens Science Objective* | *National Science Education Standards Addressed by This Objective* |
|---|---|---|
| | composition, temperatures, and winds | • Weather has measurable quantities such as temperature, wind, and precipitation (K–4)<br>• Atmospheres are mixtures of gases and vapor (5–8)<br>• Clouds form by condensation (5–8)<br>• Patterns of atmospheric movement are global (5–8)<br>• Heating causes convection in atmospheres (9–12)<br>• Energy transfer in atmospheres causes global climate (9–12) |
| Titan | Physical state and topography of Titan | • Planetary materials are solid rock, soil, and ice (K–4)<br>• Solid materials have different physical and chemical properties (K–4)<br>• Soils have color and texture (K–4)<br>• Planetary objects have layers (5–8)<br>• Rock layers may form plates that can move (5–8)<br>• Landforms result from constructive and destructive forces (5–8)<br>• Solid material is changed and recycled by compacting, heating, and recrystallizing (5–8)<br>• Planetary objects have internal and external sources of energy (9–12)<br>• Transfer of heat causes plates to move (9–12) |
| Titan | Does Titan have “life chemistry”? | • Organisms have basic needs (air, water, food, light (plants) (K–4)<br>• Organisms die if needs are not met (K–4)<br>• All animals depend on plants (K–4)<br>• All organisms cause changes in their environments (K–4)<br>• Humans depend on natural and constructed environments (K–4)<br>• Patterns of behavior are related to the organism’s environment (K–4)<br>• All organisms must be able to obtain and use resources (5–8)<br>• Regulation involves sensing the internal environment (5–8)<br>• An organism’s behavior evolves through adaptation to its environment (5–8)<br>• The major source of energy of an ecosystem is sunlight (5–8)<br>• Extinction happens when adaptive characteristics are insufficient for survival (5–8)<br>• The number of organisms in an ecosystem depends on the resources available (5–8)<br>• Atoms and molecules on Earth cycle among living and nonliving things (9–12)<br>• Organisms both cooperate and compete (9–12)<br>• The energy for life primarily derives from the Sun (9–12)<br>• Chemical bonds of food molecules contain energy (9–12) |
| Saturn’s rings | Configuration of the rings | • Planetary materials are solid rock, soil, and ice (K–4)<br>• Solid materials have different physical and chemical properties (K–4)<br>• Soils have color and texture (K–4) |

| *Cassini–Huygens Area of Interest* | *Cassini–Huygens Science Objective* | *National Science Education Standards Addressed by This Objective* |
|---|---|---|
| | | • Planetary objects have layers (5–8)<br>• Solid material is changed and recycled by compacting, heating, and recrystallizing (5–8)<br>• Planetary objects have internal and external sources of energy (9–12) |
| Saturn's rings | Why rings formed and their patterns | • Models of the solar system show patterns that cause seasons and the appearance of planetary objects in the night sky (5–8)<br>• Tidal patterns can be understood as a result of Sun/Moon gravity (5–8)<br>• Seasons result from variations in the amount of the Sun's energy hitting the surface (5–8)<br>• Patterns of rock layers help estimate geologic time (9–12) |
| Saturn's rings | Why are there satellites in the rings? | • Relative sizes of the Sun and planetary objects including small bodies (comets, asteroids, moons) can be calculated and modeled (5–8)<br>• The size of the orbits of all solar system objects can be calculated and modeled (5–8)<br>• Objects in the solar system differ in composition including rocky and gaseous materials (5–8)<br>• Many objects in the solar system are in dynamic change (9–12)<br>• Motion can be described from an object's position, direction, and speed (5–8)<br>• Objects in the solar system are in regular and predictable motion (5–8)<br>• Gravity is the force that keeps objects in orbits around the Sun and the rest of the motion in the solar system (5–8)<br>• Laws of motion can be calculated precisely by knowing the effects of forces on objects (9–12) |
| Icy satellites | Geologic histories of satellites | • Planetary materials are solid rock, soil, and ice (K–4)<br>• Solid materials have different physical and chemical properties (K–4)<br>• Soils have color and texture (K–4)<br>• Planetary objects have layers (5–8)<br>• Rock layers may form plates that can move (5–8)<br>• Landforms result from constructive and destructive forces (5–8)<br>• Solid material is changed and recycled by compacting, heating, and recrystallizing (5–8)<br>• Planetary objects have internal and external sources of energy (9–12)<br>• Transfer of heat causes plates to move (9–12) |
| Icy satellites | Dark and light material | • Objects can be sorted by their properties (K–4)<br>• Materials can exist in different states: solid, liquid, and gas (K–4)<br>• Substances have characteristic properties such as density, boiling point, and solubility (5–8) |

| *Cassini–Huygens Area of Interest* | *Cassini–Huygens Science Objective* | *National Science Education Standards Addressed by This Objective* |
|---|---|---|
| | | • Mixtures of substances can be separated (5–8)<br>• Substances react chemically in characteristic ways to form new substances (5–8)<br>• Compounds have properties that are different than the substances that made them (5–8)<br>• Substances can be placed in groups if they react in similar ways (5–8)<br>• Chemical elements do not break down in the laboratory (5–8)<br>• There are 100 known elements that can form compounds (5–8)<br>• Compounds combine to form living and nonliving things (5–8)<br>• Solids, liquids, and gases differ in the distance and angles between molecules or atoms (9–12)<br>• Carbon atoms can bond to one another in chains, rings, and branching. Large molecules are essential to life. (9–12)<br>• Chemical reactions can release or consume energy (9–12) |

## 2b. Collaborations and Partnerships

Creating a nation of Saturn enthusiasts will require the help and expertise of a multitude of partners. From rural communities to urban neighborhoods, we will focus on alliances and networks as the most effective way to leverage resources and distribute knowledge.

Our nation's classrooms have focused education on literacy in the early grades, especially K–4. Key partnerships, such as the nationally recognized *Bay Area Writing Project* and the *International Storytelling Center*, will help translate the science of the Cassini–Huygens mission into literary modules, which will help to keep science in the classroom. Early and continued engagement in science and the use of interdisciplinary methods will accommodate a wide variety of learning styles and teaching methods to maximize opportunities for young students to share in Cassini–Huygens science.

In addition, this plan seeks strong intellectual linkage to Cassini–Huygens science through collaborations with astronomy groups, Solar System Ambassadors, and the informal education community across the nation. Use of existing infrastructure with the Solar System Ambassadors coupled with the informal education community will allow for a personal interaction with Cassini–Huygens science, while the mission continues its extensive study of the Saturnian system.

We will develop partnerships and collaboration at every opportunity to expand our reach and solicit new ideas annually to keep the program innovative. We have emphasized partnerships with expandable, national reach. The following table identifies key cooperative partnerships to date.

***Key Partnerships***

| *Partnership Organization* | *Headquarters Location* | *Cassini–Huygens Public Engagement Program Activity* |
|---|---|---|
| Bay Area Writing Project/California Writing Project/National Writing Project | Berkeley, Calif. | Formal Education — K–4 Science Literacy |
| Caltech Pre-college Science Initiative | Pasadena, Calif. | Formal Education — K–4 Science Literacy/Center–Notebooks Initiative |
| Brian Sullivan | Utah; Colorado | Informal Education — Planetarium Show |
| Exploratorium | San Francisco, Calif. | Informal Education/Museums and Planetariums — Probe Mission Experience Webcast |
| Chabot Space and Science Center (Along with Edinboro University and Planetarium) | Oakland, Calif. | Diversity/Visually Impaired — Alternative Ways of Experiencing Saturn, Tactile Sets of Saturn |
| Edinboro University and Planetarium | Pennsylvania | Diversity/Visually Impaired — Alternative Ways of Experiencing Saturn, Tactile Sets of Saturn |
| Lewis Center for Educational | Goldstone, Calif. | Formal Education, Radio Science, and |

| *Partnership Organization* | *Headquarters Location* | *Cassini–Huygens Public Engagement Program Activity* |
|---|---|---|
| Research/Goldstone Apple Valley Radio Telescope (GAVRT) | | Teacher Training |
| National Action Council for Minorities in Engineering (NACME) | New York, New York | Formal Education and Diversity — Figure This! (Math, Grades 5–8) |
| International Story-Telling Center | Jonesboro, Tenn. | Formal Education and General Public |
| Raytheon | Lexington, Mass. | Internet — Web site Development and Maintenance |

Other partnerships will evolve as contracts for program implementation are developed.

A core element of effective partnering is collaboration with existing NASA infrastructure, resources, and efforts in E/PO. Key relationships utilized in this Public Engagement Plan include those listed in the following table.

***Key Relationships with NASA Infrastructure, Resources, and Efforts in E/PO***

| *Responsible NASA Organization* | *Program(s)* |
|---|---|
| NASA Solar System Exploration Mission and Office of Space Science–sponsored E/PO Efforts | • Solar System Ambassadors<br>• Solar System Educators<br>• Goldstone Apple Valley Radio Telescope program |
| NASA Office of Space Science (OSS) E/PO Support Network | • Co-facilitation with Solar System Exploration Education and Public Outreach Forum (SSEF) of Solar System Observers Network through Saturn Observing Campaign, Country ROADS Community Solar System Nights<br>• Participation in SSEF/OSS relationships with Girl Scouts of the USA and 4-H<br>• NASA OSS Broker/Facilitators: Through the DePaul University broker, participate in the science reading initiative in Illinois led by Gwen Pollock, the Illinois State Science Supervisor, who has recently joined the Illinois State Board of Education Division of Reading. We will work with all seven brokers to encourage participation in and local organizational connectivity (including museums) in the Saturn Observing Campaign, and facilitate connections for local youth group training.<br>• Space Science Education Resource Directory, OSS product review, OSS E/PO Annual Report |
| NASA Office of Education | • The Center for the Study of Terrestrial and Extraterrestrial Atmospheres (CSTEA) at Howard University (NASA University Research Centers [URC] at Minority Institutions program) |
| JPL Educational Affairs | • JPL E/PO Office/California State University Pre-Service |

| *Responsible NASA Organization* | *Program(s)* |
|---|---|
| | Teacher Initiative |

Additionally, the plan is designed to be compatible with the media activities in the *Cassini–Huygens Public Affairs Plan* (published July 1999), approved by the JPL Media Relations Office and NASA Public Affairs Office (Code P).

## 2c. Involvement of the Science Community

The Cassini–Huygens Public Engagement Plan utilizes the efforts of Cassini–Huygens scientists, engineers, and the technical community in ways that take advantage of their unique talents. These mission team members have a special and important role in enhancing scientific and technological literacy throughout the country as role models for the next generation. Opportunities abound through public speaking engagements, Webchats, materials review, media interviews, and responses to public inquiries. For example, a Cassini scientist speakers group has been active in giving public talks, and Cassini team members have been working with the visually-challenged community and astronomy groups as consultants and creators of educational materials, and as technical guides for activities, Web content, and press releases.

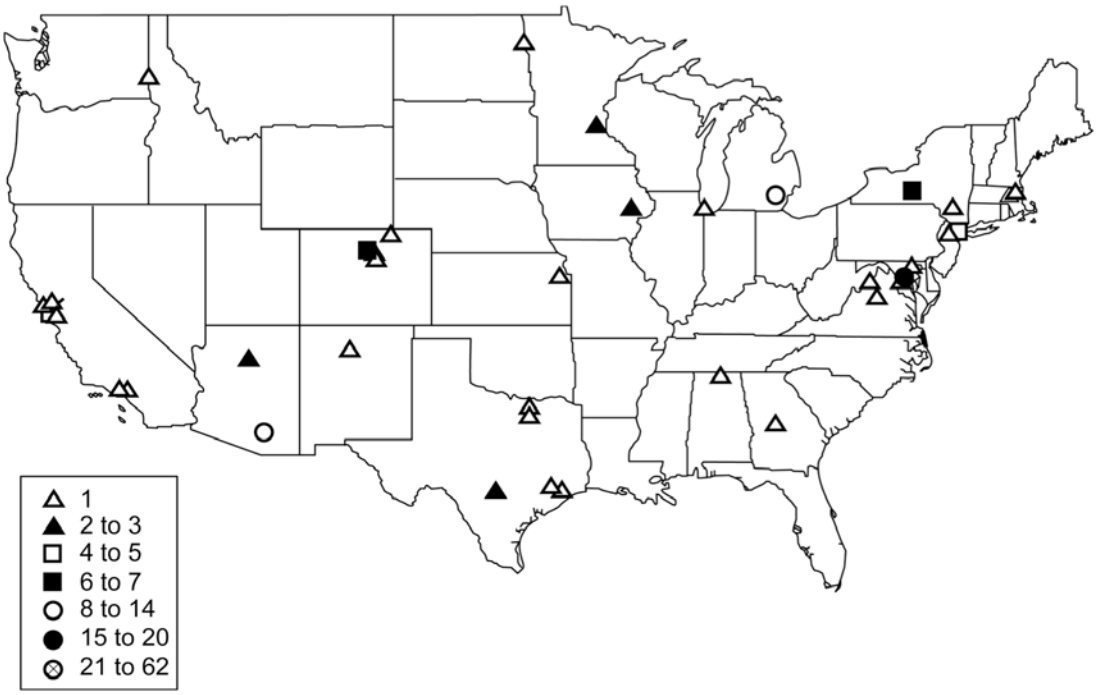
Cassini–Huygens public engagement staff will also continue to interact regularly with mission team members by attending and presenting at key staff meetings, and with the wider group of project science teams through presentations and participation in Project Science Group (PSG) meetings.

### The Resource: Cassini–Huygens Research Scientists

More than 250 research scientists are currently associated with 18 Cassini and 9 Huygens investigations. These scientists are divided fairly equally between the United States and 13 European nations. The list also includes one science team member from Israel and one from Mexico. Nine of the 27 investigations (six U.S., three French) are interdisciplinary in nature. Each of the 18 science teams includes at least two U.S. scientists and at least one European scientist. The U.S. scientists are represent 19 states and the District of Columbia.

Specific tasks targeted for scientist involvement are listed in later sections of this document. While not all of the Cassini–Huygens scientists will be directly involved in the tasks outlined, their wide range of expertise and broad geographic distribution can be put to good use for specialized tasks for the Cassini–Huygens Public Engagement Plan. In general, their public engagement efforts will be coordinated within their investigations, but many scientists will have the time and interest to be involved in more cross-disciplinary efforts. In such cases, the efforts of the U.S. scientists will be coordinated through the Cassini Program at JPL. The cross-cutting efforts of European scientists will be coordinated through the Huygens Project Scientist, Jean-Pierre Lebreton, and through other ESA public engagement personnel. Science investigators in the U.S. are shown here (see accompanying figure, below) by state.

***U.S. Science Investigators***



## 2d. A Multinational Effort

Because of the cooperative international nature of the Cassini–Huygens mission, a unique opportunity exists to extend the reach of public engagement activities seeded by NASA overseas to our European partner nations. The mission will truly be experienced by people around the world, allowing them to share the excitement of exploring another planet. Working with the European Space Agency (ESA) will offer an opportunity to leverage and model each other's activities. Capitalizing on the strengths of the public engagement capabilities of each of the agencies will enhance both programs.

Members of the Cassini–Huygens science teams associated with ESA have expressed interest in developing a plan for implementation in their countries, in conjunction with the Cassini–Huygens public engagement team at JPL. At the initiative of the ESA Huygens Project Scientist, a working group, called the Cassini–Huygens European Public Outreach Working Group (CHEPOWG), has been formed to address the issue. CHEPOWG produced a preliminary report in mid-November 2001, which was distributed within the ESA Science Communication Office, the office in charge of coordinating communication activities for all ESA science programs. CHEPOWG is currently awaiting ESA's evaluation of the proposed plan.

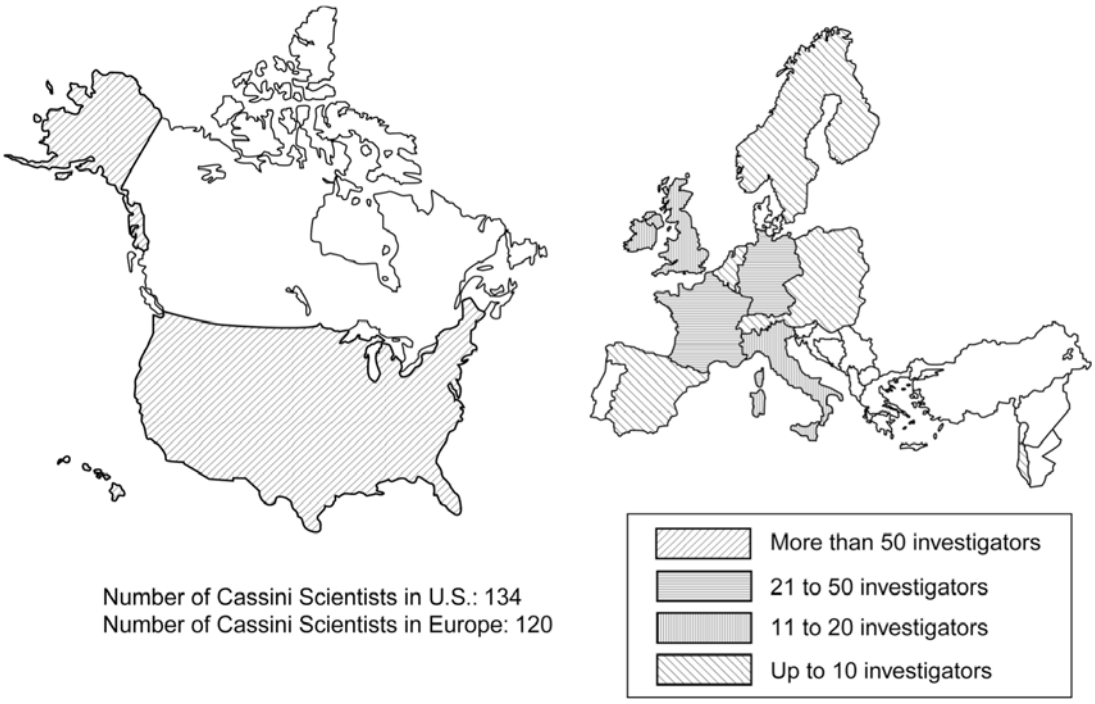
The CHEPOWG proposal includes a baseline set of complementary public engagement activities within the multinational, multilingual European community. The ideas put forward by CHEPOWG include:

- Translate selected Cassini–Huygens English-version products into multilingual versions;
- Provide electronic files of materials to be translated into the host country's language;
- Develop relationships with organizations and events related to space activities such as museums, colleges and universities, amateur astronomical associations, and science shows in European countries, and solicit their involvement in key public activities;
- Participate in public speaking events; and
- Support the development of products that can be used for European audiences.

Once approval has been received from the ESA Science Communication Office, CHEPOWG anticipates developing a mature public engagement plan that may also involve cooperation with the newly created ESA education office.

Cassini–Huygens science investigations are represented throughout the United States and Europe, as shown in the accompanying figure (below).

***Scientists in the U.S. and Europe***




Number of Cassini Scientists in U.S.: 134
Number of Cassini Scientists in Europe: 120

## 3. TARGET AUDIENCES AND DELIVERY MECHANISMS

Cassini–Huygens public engagement will extend into the heart of local communities on a global scale, and especially strive to reach those who are underserved. An interdisciplinary approach will allow for dissemination of information in a variety of formats to ensure that the ongoing story of the Cassini–Huygens mission is told through visual, literary, and scientific means.

The Cassini–Huygens Web site will host and disseminate information about all aspects of the mission, with mission updates, spotlights on human interest stories, support and educational materials for educators, data sets for students and researchers, and a wealth of images that will provide the first glimpses of the Saturnian system for this generation.

To ensure distribution of Cassini–Huygens materials to communities without Internet access, printed materials will be made available though various NASA Educator Resource Centers (ERCs) and other public venues.

The following table shows the Cassini–Huygens themes (*The Destination*, *The Exploration*, and *The Mission*) and sub-themes mapped to the years in which activities and programs are anticipated to take place.

| THEME | EMPHASIS Year | FORMAL EDUCATION | | | INFORMAL EDUCATION | | GENERAL PUBLIC | MEDIA | INTERNET |
|---|---|---|---|---|---|---|---|---|---|
| | | K–4 | 5–8 | 9–12/CC | Youth, Community, Libraries | Planetaria, Museums | | | |
| ***The Destination*** Saturn & Its Rings: Jewel of the Solar System | 2003–2004 | Literacy program | Interdisci-plinary units | Planetary data/ Discoveries | Saturn Observing Campaign; Storytelling | Planetarium show (core); Docent training | Saturn Observing Campaign; Solar System Ambassadors | Arrival media event; Media activity set | The Saturn Story; Data releases |
| Titan: The Shrouded Moon | 2004–2005 | Literacy Program | Interdisci-plinary units | Planetary data/ Discoveries | Storytelling | Planetarium show suppl.; Docent train-ing; Probe mis-sion museum Webcast experience | Saturn Observing Campaign; Solar System Ambassadors | Probe release media event; Media activity set | The Saturn Story; Data releases; Probe mission museum Webcast experience |
| Learning the System (The Saturnian System, Connection to the Solar System, Earth & Mars) | 2005–2006; 2006–2007 | Literacy program | Interdisci-plinary units | Planetary data/ Discoveries | Storytelling | Planetarium show suppl.; Docent training | Solar System Ambassadors | Media activity set | The Saturn Story; Data releases; Comparing the Planets Web page |
| ***The Exploration*** Personal Nature of Exploration | 2005–2006, 2006–2007 —Personal/ Social/ Emotional Connection | Literacy program | Interdisci-plinary units | | Storytelling; Saturn Observing Campaign | Saturn Observing Campaign; Probe mission museum Webcast experience | Saturn Observing Campaign | E/PO program participation stories | I Sent My Name to Saturn; Internet e-cards |

| THEME | EMPHASIS Year | FORMAL EDUCATION | | | INFORMAL EDUCATION | | GENERAL PUBLIC | MEDIA | INTERNET |
|---|---|---|---|---|---|---|---|---|---|
| | | K–4 | 5–8 | 9–12/CC | Youth, Community, Libraries | Planetaria, Museums | | | |
| ***The Exploration*** (contd.)<br>Personal Nature of Exploration | —The Human Face of Exploration | | | | Scientists as neighbors & role models; diverse professionals Cassini–Huygens speakers | Diverse professionals Cassini – Huygens speakers; Probe mission museum Webcast experience | Cassini – Huygens speakers bureau; Solar System Ambassadors | Media training; Live shots | Internet "Spotlights" |
| Technology and Robotic Exploration (Seeing through Multiple Eyes) | 2004–2005 | | Interdisci-plinary units | Planetary data/ Discoveries Math | | | | Animations; Data visualizations | The Saturn Story; Data releases; Probe mission museum Webcast experience |
| Cumulative Nature of Science (Cassini–Huygens Legacy) (What's Next?) | 2007–2008 | Literacy program | Interdisci-plinary units | Planetary data/ Discoveries Math | Storytelling | Planetarium show supplement; Docent training | | Media activity set (press releases; video files; live shots; press briefings) | The Saturn Story; Data releases; Comparing the Planets Web page |
| ***The Mission***<br>A Multinational Effort: Exploring Another Planet Together | 2004–2008 | Literacy program | Interdisci-plinary units | | Scientists as neighbors & role models; diverse professionals Cassini–Huygens speakers | Diverse professionals Cassini –Huygens speakers; Probe mission museum Webcast experience | Cassini–Huygens speakers bureau; Solar System Ambassadors, SOC | | The Saturn Story; Data releases; Probe mission museum Webcast experience |

## 3a. Evaluation

The Cassini–Huygens Education and Public Outreach Program will ensure the quality, impact, and effectiveness of its products through evaluation from design to dissemination. Key products of this plan will have specific long-term goals identified with clear benchmarks for evaluating progress. In addition, the Caltech Precollege Science Initiative (CAPSI) has been selected as a partner specifically to evaluate the "cornerstone" products developed for the formal community.

GOAL

Our goal is to design sustainable programs that have a lifetime beyond the years of the Cassini–Huygens mission, building for life-long learning ("leaving footprints on an un-walked beach").

OBJECTIVES

- To provide feedback to the Cassini–Huygens E/PO team members as to the effectiveness of the program and/or need for revision, accomplished through formative evaluation.
- To measure the impact and footprint of the Cassini–Huygens E/PO program, or collective evaluation, for the purpose of providing lessons learned for future efforts, with a focus on formal education products.

APPROACH

Cassini–Huygens E/PO will establish an evaluation team to ensure that evaluation results are communicated to the Cassini–Huygens E/PO team on a regular basis. The evaluation team will be responsible for coordinating timelines, evaluation expectations, and strategy for integrating evaluation results into existing program development. Independent evaluators will be chosen based on reputation, history of conducting evaluations of similar scope, reasonable deliverable fulfillment, and cost-efficiency. The evaluation methodology is as follows —

- Identify Evaluation Questions — The evaluation team will work with the independent evaluators to identify essential evaluation questions. Together they will identify exactly what the Cassini–Huygens E/PO team would like to learn from the evaluation.
- Identify Measures of Success — A set of outcomes will be identified by the evaluation team and project staff, indicating whether the goals of the Cassini–Huygens E/PO plan have been met. Outcomes of the Cassini E/PO plan will be measured in accordance with this set of outcomes.
- Test Essential Assumptions — A set of assumptions will be identified that will be used to frame the context within which measures and outcomes of the Cassini–Huygens E/PO plan will be assessed and evaluated (i.e., Does success in program goals contribute to success in overall project goals?).
- Integration of Results of Formative Evaluation — Results of formative evaluation will be regularly communicated to Cassini–Huygens E/PO program teams to influence the future direction of the program.

Beyond the life of the mission there are footprints and legacies to be offered by the Cassini–Huygens Education and Public Outreach program. Its "lessons learned" will benefit Cassini–Huygens and other outreach programs at NASA.

## 3b. Formal Education

### Overview

GOAL

The Cassini–Huygens Public Outreach/OSS-developed educational products and activities are being designed to equitably enhance the quality of mathematics, science, and technology education for all at the K–12 level.

OBJECTIVES

- Create developmentally appropriate and progressive learning opportunities for students;
- Capitalize on educational reforms to leverage learning opportunities;
- Design instructional materials and programs that will be sustained during and after the life of the Cassini–Huygens mission;
- Develop partnerships to facilitate implementation and dissemination; and
- Utilize tools to ensure alignment with national and state standards in content, professional development, and assessment.

"…a key element to success in formal education K–12 will be well-articulated links to the National Science Education Standards." —Al Hovey, Jr., NCMSC/NCREL, Program Associate

RATIONALE

This plan represents a thoughtful and informed approach to education by recognizing the needs and interests of students and teachers in each of the educational segments: K–4, 5–8, 9–12, and above, as designated in National Science Education Standards.

*K–4 and Diversity*

Because literacy is critical in early stages of learning and academic achievement, and literacy efforts in schools are paramount in the current environment, we are using the science of the Saturnian system and the technology of the Cassini–Huygens mission to enhance K–4 literacy learning opportunities for "all children for life." Existing quality materials in this area are either developmentally inappropriate or missing. Science through literacy is described as a "deserted beach." Shirley Brice Heath[1] established the importance of storytelling in designing contexts of educational equity for poor and minority children. Furthermore, language/reading and primary grade materials are scarce in the existing NASA education materials inventory. The Cassini–Huygens mission seeks to fill that important niche.

*Progressive Approach to Formal Education*

We plan to capitalize on a progressive scheme that will maintain students' interest in Saturn exploration with interdisciplinary studies in grades 5–8. These activities and programs will be complemented with challenging, authentic science learning opportunities for students in grades 9–12 and above, using planetary data and new discoveries of the Cassini–Huygens mission.

[1] Heath, S.B. (1983). *Ways with words: Language, life and work in communities and classrooms*. New York: Cambridge University Press.

## Approach

Our education plan has three major thrusts:

1. For grades K-4, we have developed a literacy program that uses the science of the Saturnian system and technology of the Cassini–Huygens mission as inspiration for writing prompts. With science content and processes appropriate for this group, students will engage in reading and writing activities to strengthen these skills and to develop an interest in the process of discovery.

2. In grades 5–8, interdisciplinary units about Saturn and the voyage of Cassini–Huygens will complement the K–4 literacy emphasis, with frequently requested interdisciplinary materials that incorporate science, mathematics, language arts, history, astronomy, engineering, and the arts. The Lewis Center for Educational Research/Goldstone Apple Valley Radio Telescope (GAVRT) will provide exciting real-time experiences to students. Interactive materials will use the existing network of trained teachers who have participated in this highly successful program.

3. For grades 9–12, we plan to continue the interdisciplinary units and establish a series of opportunities for students to participate in authentic Cassini–Huygens science. In a preliminary test of the "Planetary Science Guild," tutorial materials using data from NASA's Planetary Photojournal and the Planetary Data System will enable students to experience authentic scientific procedures and protocols, including image processing that involves visualization and analysis of Cassini–Huygens data.

The scope and focus of the 9-12 program has changed to maximize the unique learning opportunities available from Cassini science data. Instead of the data analysis program described above, Cassini Formal Education has chosen a different path, thus developing a curriculum module with a strong emphasis on mathematics as they relate to the complex geometries of the Saturn ring system.

***Formal Education Program Element Breakdown***


*Teacher Training*

Working through the JPL Education Office, we will supply teacher training materials to the California State University system, which trains thousands of our nation's teachers. CSU produced 11,858 teachers in 1999–2000 — 59 percent of California's total. We will also work with programs such as the Solar System Educator Program, which provides a yearly opportunity to introduce a cadre of educators to new Cassini–Huygens educational products. The Educators will train in the use of these curricular products and then disseminate them at workshops in their home school districts, where they are expected to train 100 teachers.

Educator training has taken a lesser role over the past year due to funding and time constraints. The priority for 2003-2004 was the completion and dissemination of the K-4 language arts program. Teacher training programs will be purused in CY 2005.

*NASA OSS Broker/Facilitators*

Through the DePaul University broker, Cassini–Huygens E/PO will participate in the science reading initiative in Illinois led by Gwen Pollock, the Illinois State Science Supervisor, who is a member of the Illinois State Board of Education Division of Reading.

I don't honestly remember this being in the plan or what it is. Yikes.

## Audience and Customers

The following table keys the Cassini–Huygens themes to grade levels.

***Cassini–Huygens Theme and Grade-Level Distribution***

| *Educational Themes* | *K–4* | *5–8* | *9–12* | *CC** |
|---|---|---|---|---|
| Saturn, Jewel of the Solar System | X | X | | |
| New Knowledge and the Personal Nature of Exploration | X | X | | |
| Titan: The Shrouded Moon | | X | X | X |
| The Saturnian System | | X | X | X |
| Technology and Robotics — Extending our Senses | | X | X | X |
| Cassini–Huygens Lessons — The Cumulative Nature of Science | | X | X | X |

*Community College

## Delivering the Message

The Cassini–Huygens formal education element will use the Internet as the primary mechanism for product and materials dissemination. Activities, units, and curriculum enhancement materials will be posted on the "education" portion of the Cassini–Huygens Web site. A section of the Web site, the "Electronic Chalkboard," will be used to engage and inform educators, students, and the public. This feature allows us to test our products efficiently on a nationwide basis and allows educators to:

- Post materials;
- Download materials for testing and classroom use;
- Talk with formal education team members regarding the product's viability in specific markets; and
- Talk with others in the education community.

We will also disseminate materials through the OSS E/PO Support Network. Materials will be introduced to educators throughout the country via:

- Cassini–Huygens personnel presentations at professional workshops, conferences, and teacher in-service programs;
- Solar System Educator Program workshops; and
- Leveraging of the existing NASA education network (i.e., broker-facilitators, the Educator Resource Center Network [ERCN], the Aerospace Education Services Program [AESP], and NASA education Web sites).

## Partnerships and Collaborations

- *Bay Area Writing Project/California Writing Project/National Writing Project
- *Project FIRST
- *CAPSI/Center–Notebooks Initiative (based on Japanese Lesson Study Model)
- Goldstone Apple Valley Radio Telescope (GAVRT)
- NASA's Planetary Data System

* See Appendix F, "Literacy Partners — Background and Biographies."

## Tasks Targeted for Scientist Involvement

- Scientists will review all products for scientific accuracy.
- Scientists will participate in Teacher Workshops to assure that participating teachers understand the scientific principles and processes of the Cassini–Huygens mission.
- As data are returned, scientists will assist in interpretation of results in language understandable to teachers and their students.
- As time, resources, and personal talents permit, scientists will visit local schools, school districts, community colleges, colleges/universities, and/or tribal colleges, etc., to serve both as resources for dissemination of recent scientific findings and as role models to help students understand the human element of this amazing scientific endeavor.
- ESA scientists will assist in the translation of a selected set of materials into French, Dutch, German, Italian, and Spanish languages.

## Timeline

The following tables illustrate timelines and grade levels. (This timeline information is also contained in Appendix B, "Implementation Schedule.")

### *Timeline: K-4 Component*

"We need to examine what children create with their drawings and writings they construct and represent their understandings in science journals, which provide an opportunity to access and assess changes in children's understandings and thinking."[2]

[2] Dana, Lorsbach, Hook and Briscoe, 1991.

| *Timeframe* | *Milestone(s)* |
|---|---|
| July 2001–2002 | BAWP, Project FIRST, and CAPSI develop plan with rubrics, articulated to the standards quilts and training, pilot in spring 2002 in selected classrooms including observing Saturn with the unaided eye. |
| July 2002 | Two-week workshop for selected participants to build the first unit of the K–4 program. Workshop will be coordinated between BAWP, Project FIRST, CAPSI, and JPL. |
| July 2002–2003 | Training packet in final form, professional development of participant teachers, pilot in classrooms, evaluation of materials, presentation at conferences (NSTA, Language, Supervisors), design distance learning training model. |
| July 2003 | Final release of tested first unit. |
| July 2003 | Second two-week workshop to build the second unit of the K–4 program. |
| July 2003–2004 | Wide area dissemination, summer training via distance learning and area conferences. Publicity for Saturn orbit insertion. Continued evaluation and enhancement of materials based on results of surveys, evaluation, and advancements in best practice. |
| July 2004 | Final release of tested second unit. |
| July 2004–continuing | New Saturn discoveries provide material for continued writing and connection to Earth (life of student). |

***Timeline: 5-8 Component***

The GAVRT/Cassini partnership has changed considerably since this plan. We are establishing a 2-pronged approach to this program.

1. Students will take radio observations of Saturn over time and measure for changes in ring tilt.
2. A different group of students will further refine and analyze the Jupiter 2000 data for eventual publication in a referreed scientific journal.

| *Timeframe* | *Milestone(s)* |
|---|---|
| Aug 2001–Jan 2003 | Meet with partners (Pat Reeder, GAVRT), design scope and themes plan using rubrics, articulated to standards quilt of interdisciplinary units. Meet with Cassini–Huygens team, review relevant materials from those already created ("Ways of Seeing" CD-ROM, *Saturn Educator Guide*, Saturn in the Kitchen, *Passage to a Ringed World*) and current data, including observing Saturn with telescope, to use in design of unit. |
| Jan–Jul 2003 | Gather team of 5–8 teachers, design initial interdisciplinary unit with GAVRT Saturn observation as part. |
| July–Dec 2003 | Training packet in final form, training of participant teachers, including the Solar System Educators Program participants; pilot in classrooms; evaluation of materials, presentation at conferences (NSTA, Language, Supervisors, NCTM, etc.); design distance learning training model. Recruitment of teachers to enlarge pilot project. |
| Jan–Jul 2004 | Wide-area dissemination, summer training via distance learning and area conferences. Publicity for Saturn orbit insertion. Continued evaluation and enhancement of materials based on results of surveys, evaluation and advancements in best practice. New interdisciplinary units created by participating teachers. |

| *Timeframe* | *Milestone(s)* |
|---|---|
| July 2004–continuing | New Saturn discoveries provide material for continued writing and connection to Earth (life of student) and creating of new interdisciplinary units. |

***Timeline: 9–12 Component***
***The Planetary Scientist Guild, grades 9–12; using new and archived data***

| *Level* | *Activity* |
|---|---|
| Novice–(HS) | Observation and comprehension using units created for the Cassini–Huygens classroom program. |
| Apprentice–(HS) | Learning methods of Analysis, Practice and Initial Application. |
| Journeypersons–(CC) | In-depth analysis of data in partnership with Cassini–Huygens scientists. |
| Experts/Masters | Cassini–Huygens scientists/Principal Investigators who assist in identification of appropriate data as it is received. |

Since the 9-12 program has changed so dramatically, this no longer applies.

## Professional Development for Credit

We will seek partnerships with institutions of higher learning to develop the possibility of their offering continuing education or graduate credit for work on this project.

## Evaluation

Metrics and an informal assessment must be a part of all formal education elements. Cassini–Huygens Formal Education will be an integral part of the comprehensive evaluation program. In addition, all formal education activities, as well as ALL relevant activities will be reported through the NASA Office of Education Computer-Aided Tracking System (EDCATS).
The evaluation piece is part of the larger Cassini-Huygens E/PO evaluation plan. Formal Education is seeking ways to track teacher usage of our products through a web-based voluntary survey. In addition, we are planning to start a teacher's sharing page on the education portion of the website where educators can post their best practices, tips, and achievements using Cassini-Huygens materials. This page will give the Formal Education Outreach Team insight into the breadth of dissemination both geographically and by grade level.

## 3c. Informal Education

## Planetariums, Museums, Youth Groups, Community, and Libraries

### Overview

BACKGROUND

A 1999 report by Lake, Snell & Perry, which gathered information from various groups such as the Sustaining Museums Work Group, indicated that "American museums average approximately 865 million visits per year or 2.3 million visits per day." The informal education communities are proving to be effective, creative resources for encouraging science and technology literacy, and a vital part of NASA's efforts to provide unique teaching tools and to inspire the next generation of explorers.

GOAL

Museums, science centers, youth groups, libraries, and planetariums are expert in reaching mass audiences and in presenting material in a way that is appropriate to their particular audiences. We will join with them to provide timely, inspirational experiences.

Programs at these institutions will naturally provide a "local" slant to what will truly be an international story of exploration and discovery. Events and information at local museums, science centers, etc., will also attract the local media, adding another dimension of participation by the local community.

OBJECTIVES

Science can be a lifelong adventure. Cassini E/PO aims to launch people on that adventure by introducing science within the comfort and familiarity of neighborhood programs. Cassini–Huygens public engagement will:

- Create training programs for youth organizations.
- Design instructional materials, programs, and activities that are culturally sensitive and suitable for the formal and informal education environment, and that will be sustained during and after the life the Cassini–Huygens mission.
- Explore high-leverage opportunities for training leaders of youth organizations.
- Develop a schedule of star parties that include a storytelling component.
- Provide high-definition visualizations for immersive experiences in informal settings, classrooms, museums, and other places of public gathering.
- Blaze a relationship trail with 4-H Clubs and the visually impaired.

RATIONALE

From science centers to libraries to planetariums to neighborhood community centers, the diverse informal education community embodies one of the Cassini–Huygens Education and Public Outreach principles: *"To bring science and the Saturn experience to many different groups in all that we do."*

## Approach

In communities and neighborhoods beyond the classroom, Cassini–Huygens will work with informal education partners to share the wealth of science, data, and images with the American public in the comfort of their own neighborhoods. Key partners will advise us on the best ways to serve their communities and reach underserved audiences.

The selected museums have a major commitment to the enhancement of public understanding of space science and/or technology as part of their core missions. These key institutions have existing outreach programs to diverse and underserved populations, and exhibits and facilities designed to be accessible in accordance with the Americans with Disabilities Act (ADA). Strong ongoing evaluation programs are also part of their missions.

Working with youth groups gives us the opportunity to engage young people in science in a friendly setting. An informal venue, such as a camp-out, an all-night event at the YMCA/YWCA, a planetarium/museum visit, or any other setting with a relaxed atmosphere is perfect for reinforcing learning derived from formal education. The focus of our interactions with youth groups will be to "observe, train, and write." Science literacy is the responsibility of society, not just schools. The Cassini–Huygens formal education effort will develop multidisciplinary units and align informal education activities such as star parties, training programs, etc., with the formal education effort.

We will begin our youth group efforts with 4-H clubs, the largest youth group in the world. We will help them add to their curriculum science and technology components that tell our story. We will also support NASA's efforts with the Girl Scouts of the USA (GSUSA). As international organizations, 4-H and GSUSA will give us pathways to the international population.

## Programs for the Informal Community

*Probe Mission Museum Webcast Experience*
*Exploratorium, San Francisco*

Museum-goers around the world will share in the excitement of the Cassini–Huygens mission "as the scientist experiences it" through a pair of live Webcasts/TV broadcasts. The first will be a one-hour program during Saturn orbit insertion on July 1, 2004, followed on January 14, 2005 by a two- to four-hour event during the Huygens probe's descent through Titan's atmosphere. San Francisco's Exploratorium will produce the events and coordinate distribution via an international network of at least 70 museums. We can also investigate the use of NASA TV Select as an additional distribution medium.

The program will originate from the Exploratorium Webcast studio, with live connections to the image data and to host and interpretive staff at both JPL (for Saturn orbit insertion and the Huygens mission) and ESA mission control (for the Huygens mission). Precursors for these events include the successful Eclipse 98, Eclipse 99, and Eclipse 01 programs pioneered by the Sun–Earth Forum, as well as the Exploratorium's own "planetary flybys" that began with the Pioneer 10 visit to Jupiter in 1973.

The Webcast/TV experience will include live interviews with project scientists, interpretation of the images and data through hosts at the various locations, and the story of the mission and its operation presented through previously recorded material.

The museums in the network will each promote the events locally and develop on-site programming with local scientists and museum staff, assisted by JPL and the Exploratorium. Material provided to the museums in advance will allow them to provide their own scientific interpretation with their own staff or visiting astrophysicists.

The Webcast will also be made available live to the general public, and will be archived on the Exploratorium's award-winning Web site within contextual pages that discuss the mission. Participants will be able to ask questions of project scientists, read about the mission, and learn about Saturn and Titan.

The Exploratorium's Webcast partners include the *New York Hall of Science (NYHS)* and *Chabot Space and Science Center*.

Located in the largest media market in America, NYHS is a hands-on science center that serves the Corona area of NYC/Long Island. Corona is 70 percent first-generation immigrants primarily of Spanish and Asian origin, and 104 languages are spoken there. It has been described by the *New York Times* as the "epicenter of immigration" in this country. The museum's "Explainers" provide verbal translations to the guests. The NYHS director, Dr. Alan J. Friedman, will be trained as a local public and media rep for the Cassini–Huygens mission. Dr. Friedman is a physicist and astronomer, and has been recognized for his leadership in fostering science literacy in America. The American Association for the Advancement of Science honored him with its 1996 Award for Public Understanding of Science and Technology.

Chabot Space and Science Center is also expert in presenting science to the public. Chabot has provided astronomy and science education to individuals from diverse communities throughout the Bay Area since 1883. According to the 1990 census, the population of Oakland is 372,242 people and is composed of eight major ethnic groups speaking at least 82 languages. Like the New York Hall of Science, Chabot will train its CEO and director, Dr. Michael D. Reynolds, as a local public and media rep for the Cassini–Huygens mission. Dr. Reynolds is the author of several books on astronomy and science.

The Exploratorium estimates the audience for this event to be about 200 people per museum, for a total of 14,000. In addition, they expect to have 250,000 public users of the Web site and 100,000 public viewers of the Webcast archive in the first year.

The Exploratorium will:

- Design and produce the live program in the Webcast studio with remote connections to JPL and ESA for both Saturn orbit insertion and the Huygens probe mission.
- Design and produce the Museum Network Web site and the Webcast Web site.
- Host the Webcast and Web site and host the program archive.
- Provide the video and Webcast program to museums in the U.S., Europe, and Asia.
- Provide public information support in addition to that of JPL, NASA, and other entities.
- Provide additional educational materials and event suggestions for other museums.
- Host a public event at the Exploratorium for Saturn orbit insertion and the Huygens mission.
- Work closely with JPL education staff to develop and support the museum network.

- Provide materials to various organizations such the National Society of Black Physicists and the National Organization of Black Chemists and Chemical Engineers, who will be briefed and trained as local interpreters of the mission activities during the event.

JPL and ESA will:

- Support the organization of the museum network.
- Provide supporting and press materials to the museum partners.
- Provide museum network registration and communications support.
- Provide content specialists, media material, and logistics support at locations.
- Make available the images and data from the mission.
- Provide press support through JPL and NASA.

The Exploratorium will actively seek opportunities for collaboration with other commercial and nonprofit institutions to extend the Cassini–Huygens experience to even more people. National and local media will be invited to these events at appropriate venues.

*Saturn/Cassini–Huygens Updateable Planetarium Show*

Cassini–Huygens has produced a planetarium show that is targeted at mid-range planetariums, but will also be made available in formats suitable for small and rural planetariums, community college planetariums, and other venues. Total length will be 20–30 minutes, typical for this type of program. The shows will be developed by Brian Sullivan and Dr. Bill Gutsch, who are external experts with experience in such presentations. Technical advisors include Rob Landis of Cassini–Huygens Mission Support and Operations, Dr. Ellis Miner and Dr. Linda Spilker of the Cassini science team, and Robert Mitchell, Program Manager for the Cassini–Huygens mission.

To build interest and increase anticipation of the Cassini–Huygens mission, the initial version of the show will be released in 2003 and will highlight the launch, cruise flight, flyby of Jupiter, approach to Saturn, and the story that we hope will unfold once we arrive at Saturn and begin exploring. The show will be designed to be easily edited for a second version, to be released in mid-2005. The first 10 minutes of the second version will be a condensation of the information from the first show on the mission overview and the flight to Saturn. The next 10 minutes will highlight the actual story of the approach to Saturn, Saturn orbit insertion, closest-approach images of the rings, the results of the probe mission, and any mission "firsts" through early 2005 (such as the Phoebe flyby and potential storms on Saturn). The remaining portion of the show will be updates covering the more recent discoveries of the mission, through slides with accompanying narration.

Initial interest in this planetarium show is very strong, including internationally: the 300-plus planetarium community of Japan, and planetariums in Spain, England, Italy, Portugal, Germany, and elsewhere have requested copies. The planetarium show will be shared with all 960-plus U.S. planetariums and a copy will be provided to all members of the International Planetarium Society (IPS). Electronic files and formats can be provided internationally at no additional cost to U.S. taxpayers, with foreign countries paying for additional translations or other formats. Domestically, multiple platforms will be created and shared with youth groups, libraries, community colleges, and classrooms across America, and a version will be placed on the Cassini–Huygens Web site. The Deep Space Network will provide copies to the visitor centers at the Deep Space Communications Complexes at Goldstone, California; Madrid, Spain; and Canberra,

Australia. Copies will be provided to such groups as the Solar System Ambassadors, the Space Place Museum, and Library Partners. A Spanish-language translation will be made available to interested audiences starting in FY 2004.

*Rural Museums and Libraries*

Given the Cassini–Huygens emphasis on literacy and storytelling, libraries are natural partners. The OSS, and specifically the Solar System Exploration Forum (SSEF), is actively brokering relationships with various library associations, including the American Library Association. Cassini–Huygens will work closely with the SSEF for opportunities to share its science.

*Multimedia Kit*

Available to any requesting planetarium, science center, or museum, this will be a multimedia kit highlighting the mission, recent activities, and discoveries, to be assembled from existing material, and included in the Community Solar System Nights in partnership with Mars Public Outreach. (For more on that partnership, see "Programs for Youth Groups.")

## Programs for Youth Groups / Diversity

*Girl Scouts of the USA*

The most developed training programs are the Girl Scouts of the USA (GSUSA) National Training Program and the ASU Mars Training Program. This training is also used for Educator Workshops. For youth groups, it is offered to trainers of leaders and leaders (adults, young adults, and parents). We will strive to make this training fun, yet scientifically correct. We will work with the national headquarters of each youth group, thus giving us many more high-leverage opportunities. GSUSA has 2.7 million girl members and 915,000 adult members.

*4-H Clubs*

Cassini–Huygens seeks ways to "bring the rural experience into the urban environment," and the 4-H Clubs will help us do that. A 4-H national headquarters representative will be part of the Cassini–Huygens Advisory Group. Cassini–Huygens will also partner with the Solar System Ambassadors, Solar System Educator Program, and other volunteer organizations to conduct Community Space Nights and Star Parties at 4-H events. The following table gives 4-H Club data.

***4-H Clubs Data***

| *Item* | *Data* |
|---|---|
| Membership | 4-H is international in scope, and is one of the largest youth organizations in the U.S., with more than 6.8 million participants and 45 million alumni. |
| Residence of Participating Youth | 10% (676,353) live on farms; 32% (2,180,488) live in towns under 10,000 and open country; 23% (1,560,667) live in towns and cities of 10,000 to 50,000; 9% (592,845) live in suburbs of cities of over 50,000; 26% (1,823,985) live in central cities of 50,000-plus. |
| Racial/Ethnic Information of Participating Youth | 30% are from minority racial/ethnic groups |
| Gender Information | 52% (3,574,245) are girls; 48% (3,260,093) are boys |

*Community Space Nights*

We will kick off our partnership with the 4-H Clubs by using the Community Solar System Nights Event Planning Material Kits, which were developed by the OSS SSE E/PO Forum Rural Outreach Working Group led by Sheri Klug of ASU and the Mars Exploration Program and Art Hammon of JPL. The kits will provide planning materials for organizing and hosting a Community Space Night: how to research and make available resources from NASA for the event, encourage community events focused on space science, familiarize parents and teachers with NASA materials, and raise awareness of NASA's commitment to informal space science education.

Each Community Solar System Nights Event Planning Material Kit includes —

- Advice and check lists for using school buildings, including liability insurance, supervision, set up/clean up, and shopping; traffic management at display activities; fundraising (donation lists, publicity); public relations/advertising (TV, press); and contacting/recruiting presenters (local, NASA).
- Sample templates for publicity/press releases and for certificates/letters.
- Organizing strategies.
- Creative suggestions for common problems and logistical difficulties/scheduling/FAQs.
- PDF or Web site URLs for NASA materials used by presenters.
- Suggestions for recruiting and training volunteers.
- Lists of suggested activities.
- Bilingual resources.
- Video — "How to Organize a Community Space Night."

Sample activities described in the kits include:

- Edible spacecraft and comet ice cream (make and eat), soda straw rockets, and comet balls (make and take).
- Planetarium (#20 room size with personal constellations) and writing center for personal constellations recording and display — volunteers to help with K–3.
- Cratering activities (mud/flour), "traffic cone" rock retrieval game, "rover races," moon cake walk, and scale solar system with beads.
- Activities: ASP, project star, Space Place.
- Moon rocks (requires training and certification).
- Local astronomers with telescopes outside for viewing.

Potential benefits/outcomes of a Community Space Night include:

- Local appreciation of schools as community resources.
- Use of school after hours and improved personal contact between parents and educators.
- Space science education event for families that provides an opportunity to model activity-based science experiences to community; provides increased use of NASA materials and improved awareness of NASA materials for teachers.

*Community Space Nights: Needs and Assets in Rural Areas*

Concentrating on rural areas gives us an opportunity to reach underserved and migrant communities. Rural communities also frequently offer such advantages as reduced event expenses and easier logistics, low light pollution, active civic and volunteer organizations, and libraries seeking partnerships and involvement with schools. Rural areas provide venues for use of NASA materials and programs, and for parent–student collaborative space science experiences. Once this program has been piloted to rural areas, a kit for inner city/urban areas will be developed.

*National Action Council for Minorities in Engineering (NACME)*

Background: The National Action Council for Minorities in Engineering (NACME) aims to increase the representation of African Americans, Latinos, and American Indians in the nation's engineering workforce. NACME approached JPL through the Minority Initiatives Office to look at ways to work more closely with NASA missions. They are very interested in working with the Cassini–Huygens mission and Navigator Program. NACME has established an Internet-based

educational site in partnership with the nation's leading educational organizations, the MarcoPolo Education Foundation. MarcoPolo features Internet content for the classroom in seven discipline-specific Web sites that house partner-created, partner-reviewed Internet-based lessons and resources. MarcoPolo makes commercial-free, standards-based content of the highest quality easily accessible to teachers and students. The gateway site is at http://www.marcopolo-education.org. At present, MarcoPolo records over 900,000 user sessions a month.

Cassini–Huygens will initiate its partnership with NACME by providing content through three of their Web sites featuring science, math, and literacy. Materials from the literacy focus of Cassini–Huygens Formal Education will be made available, and Cassini–Huygens scientists have agreed to work with Cassini–Huygens E/PO and NACME to develop materials for the MarcoPolo Web sites featuring science and math.

Another area of partnership with NACME includes a math-focused Web site targeting middle school students. *Figure This!* is a joint project of the National Action Council for Minorities in Engineering, the National Council of Teachers of Mathematics, Widmeyer Communications, and the Learning First Alliance, supported through a grant from NACME, the NSF, and the U.S. Department of Education. *Figure This!* is an initiative using a multidisciplinary approach that will demonstrate challenging middle school mathematics and emphasize the importance of high-quality math education for all students.

Elements of the *Figure This!* Initiative include:

*The Challenge* — The centerpiece of *Figure This!* will be a series of engaging mathematical challenges featured in a variety of media, including radio, television, print, and the Internet. Much like other cultural phenomena we come to expect regularly, like the daily crossword puzzle, horoscopes, or the morning traffic report, the *Figure This!* challenge will be a constant reminder of mathematics in our lives.

*Additional Resources* — There will also be a *Figure This!* Web site and a toll-free number for copies of the complete set of challenges. Partnerships will be forged with a wide variety of organizations and businesses to help distribute the challenges, potentially including newspapers, the Internet, the backs of cereal boxes, scoreboards at sporting events, and placemats at favorite fast-food restaurants.

The Cassini–Huygens mission will fund *Figure This!* to create math challenges related to the mission and exploration.

*Cassini–Huygens Outreach for the Blind and Vision Impaired*

Alan Reich, President of the National Organization on Disability, reminds us that “The disabled cross racial, ethnic and gender groups — and the disabled are among those with the lowest participation rates in the workforce. We have talented people who want to go to college, become productive citizens. They just need to be given the chance.”

Cassini–Huygens will work with the staff of Edinboro University of Pennsylvania, who have already created a tactile model of the solar system and of the Cassini spacecraft. The Chabot Museum in Oakland has also created and has begun disseminating tactile sets to the California School for the Blind. We will create several additional interactive methods for the visually

impaired to "experience" the excitement of the mission and participate in "viewing" Saturn. Specifically, we plan to:

- Work with Edinboro University of Pennsylvannia and Chabot to create and evaluate a few prototype tactile sets specific to Saturn observing.
- Make prototypes of a tactile planet-and-ring model, candidate raised-print cards showing Cassini-related content, and a tactile sky section.
- Each tactile set will be described for sighted individuals to download and assemble for visually impaired users.
- Post a test-case simplified Web site with sample Cassini–Huygens content that the Braille Institute can access for evaluation prior to release to the general public.
- Solicit mentors from the California School for the Blind who are interested in learning about the Cassini–Huygens mission and teaching others.

Cassini E/PO will also work with the Southeast Regional Clearinghouse (SERCH) and Dr. Cassandra Runyon. We have presented our K–4 literacy program, planetarium program, and Web site to a SERCH-led 2003 conference, "Extraordinary Space Science Materials for Extraordinary Children." Based on findings from that conference, we will adapt materials for special-needs children, including a closed-caption DVD of the planetarium program and a Braille version of the literacy program.

### Tasks Targeted for Scientist Involvement

- Scientists have been integral partners and have reviewed, and continue to review, all Informal Education products for scientific accuracy.
- Scientists, key planetarium staff, staff members adept in translation to other languages (particularly Spanish), and key museum directors will participate in the Cassini–Huygens probe mission museum Webcast experience. Cassini–Huygens scientists will be assisted by members of the National Society of Black Physicists (NSBP), the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE), and other minority professional societies. The Office of Minority Affairs is brokering the relationship between Cassini–Huygens and NSBP and NOBCChE.
- Scientists will assist in the preparation of preliminary results, real-time engineering and science data, and discussion and interpretation of results on the Cassini–Huygens Web sites and on individual team Web sites.
- Scientists will serve as Cassini–Huygens public speakers at times of high public interest, as well as serve as role models. The Cassini–Huygens program will provide training and presentation materials to participants in the program.
- Scientists will participate in a program to prepare imaging and radar products for blind people. Dave Doody of the Cassini Mission Operations team is actively working with Chabot to develop such products.
- ESA scientists will assist in the translation of a selected set of materials into French, Dutch, German, Italian, and Spanish languages.

"The essence of our effort to see that every child has a chance must be to assure each an equal opportunity, not to become equal, but to become different — to realize whatever unique potential of body, mind, and spirit he or she possesses." —John Fischer

## Timeline

See Appendix B, "Implementation Schedule," for timeline information for Informal Education and Youth Groups/Diversity. We will establish our timeline with existing products and programs, and our new partnerships. We can take existing products and tailor them to fit into a youth group's informal setting. We can work with existing programs, such as the Solar System Ambassadors, and give them training on storytelling, as well as the training that has been developed at NASA Johnson Space Center Outreach and Arizona State University.

## Evaluation

Metrics and an informal assessment will be part of the informal education elements. However, we recognize the immense challenge in assessing the impact of the wide network that Cassini–Huygens proposes to use in seeking to make our science and data available to "all." Kay Ferrari of the Solar System Ambassadors program developed a new Web-based front plate to the OSS EDCATS program, allowing the Solar System Ambassadors to report their wide-ranging activities in a simple Internet report that "feeds" into EDCATS. Cassini–Huygens will modify that program and test it through the informal education community and youth groups requesting materials and the planetarium show.

## 3d. General Public

### Overview

GOAL

The overarching vision and goal for Cassini–Huygens public engagement is "a shared human experience," and the theme at the heart of our work is the personal nature of exploration. We will invite the public to actively participate in the exciting exploration of the Saturn system via immersive activities. And we will incorporate diverse methods to reach diverse audiences in our efforts to engage all of our nation's children.

OBJECTIVES

Cassini-Huygens public engagement will create opportunities for shared and personal connections to the Cassini–Huygens mission through a variety of methods. We will:

- Support the diverse needs of our public by making a catalog of programs and materials available to community, youth service, and educational organizations.
- Develop a grass-roots collection of Saturn advocates through an amateur Saturn observation campaign via the World Wide Web.
- Reach out to the public through a diverse cadre of speakers and mentors trained in the science and discoveries of the Cassini–Huygens mission.
- Accommodate the public's personal connections with a comprehensive approach to handling e-mail, postal mail, and educator requests.
- Show the personal side of exploration through documentaries and Web-based spotlights.
- Use the World Wide Web to reach people in the comfort of their homes.

RATIONALE

The public will gain from and support the Cassini–Huygens mission most if they experience it on a personal level and as a shared community experience.

### Approach

We want to make Saturn a real place to people. We can do this by facilitating opportunities for people to see Saturn for themselves through telescopes across the globe, and by supporting speakers, organizations, and amateur astronomy groups. A collection of products will be made available to groups that contact Cassini–Huygens.

We will use the Internet to extend invitations to events, and to provide news and images as near to real-time as possible.

*Saturn Observation Campaign*

The Saturn Observation Campaign will engage and leverage youth groups, student groups, informal education groups, community organizations, and amateur astronomy groups in sharing in first-hand experiences of viewing Saturn. The observing campaign will be an Internet-based program hosted by the Cassini–Huygens Web site where information on current and future Saturn viewing opportunities will be posted. There will also be a "gallery" where amateur observers can post their images of Saturn.

Members of the Cassini–Huygens Saturn Observation Team (CHSOT) will lead at least three to five observation events yearly. CHSOT members have participated in online training and program activity reviews conducted by NASA's Jet Propulsion Laboratory. A section of the Cassini–Huygens Web site will be dedicated to resources, event announcements, observation techniques, and educational material related to planetary observation. Handouts for events will be available. CHSOT members will have year-round support via e-mail and the World Wide Web, and will be able to download and print materials from the Internet. They will report to Cassini–Huygens outreach regarding the number and demographics of event attendees. The initial offering for Saturn Observation Campaign partners revealed an enthusiastic and active network of astronomers, educators and organizations. Within six weeks of the Saturn Observation Campaign's debut on the World Wide Web, 143 organizations from around the world signed up.

*Earth-Based Saturn Evening-Viewing Opportunity Periods*

During the course of the Cassini–Huygens mission, Saturn is favorably positioned for evening viewing in the winter and spring months, as shown in the table below.

***Earth-Based Saturn Viewing Periods***

| *Start of Viewing Periods* | *End of Viewing Period* |
|---|---|
| December 2001 | April 2002 |
| December 2002 | April 2003 |
| January 2004 | May 2004 |
| January 2005 | May 2005 |
| February 2006 | June 2006 |
| February 2007 | June 2007 |
| March 2008 | July 2008 |

We can exploit these viewing opportunities in multiple ways as we invite the world to participate in the exploration of the Saturn system.

*Interactive Spacecraft: "Where's Cassini–Huygens?"*

The Cassini program has enjoyed strong interest with the "Where is the Cassini spacecraft now?" segment of the Cassini Web site, enabling the public to follow the mission from their home computers. Cassini–Huygens outreach will enhance this element of the Web site to include different aspects of mission operations including:

- Continued use of "Where is the Cassini spacecraft now?";
- Development of a three-dimensional spacecraft model;
- A flight operations element that shows current spacecraft status derived from real-time telemetry including: propellent levels, telemetry rates, instrument on/off, sleep/operating status, selected temperatures, bus voltage, high-gain antenna pointing, optical remote sensing pointing, fields/particles/waves rotation, etc.; and
- Incorporation of Satellite Orbit Analysis Program (SOAP) data such as heliocentric range and velocity with respect to Saturn, Earth, and the Sun.

The public can enjoy an immediate, personal connection with Cassini–Huygens by knowing how the spacecraft is doing over time and what it is doing "right now." Once developed, the page will continually update itself without human intervention.

The interactive spacecraft will be developed using the technical expertise and funding of the Real-time Operations (RTO) Element of the Cassini flight team.

## Delivering the Message

The general public focus of the Cassini–Huygens outreach strategy will make use of the following delivery mechanisms:

- Media and documentary-type groups such as Passport to Knowledge;
- Internet;
- Public mail; and
- Publications.

*Cassini–Huygens Speakers, Solar System Ambassadors, and Affinity Groups*

Cassini–Huygens outreach will work with the existing public speaker program at JPL, whose trained speakers appear at hundreds of lectures and community events throughout the year.

The Solar System Ambassadors Program competitively selects some 250–300 science education volunteers from across the country, many of whom are affiliated with informal education institutions. Ambassadors receive training and materials related to solar system exploration, and then hold a minimum of four public events per year in their local regions, ranging from exhibits in shopping malls to slide shows at concerts. In FY01, 25 percent of all Ambassador events were Cassini–Huygens/Saturn-related. In that same year, 170 Ambassadors reached approximately half a million people in 600 events nationwide.

Plans are in the works to build a framework for handling even larger numbers of participants, with special roles for "lead" Ambassadors who can mentor others. Cassini–Huygens public engagement will continue to develop materials (presentations, slide sets, videos, etc.) for Ambassadors, as well as link them to scientists through Webchats and telecons to answer their questions and keep them up to date.

In an example of synergy between efforts, science education volunteers from foreign countries, who were not permitted to participate as U.S. Solar System Ambassadors, have signed up to be Saturn Observation Campaign members. In addition, several U.S. Solar System Ambassadors have also signed up for the Saturn Observation Campaign.

*Documentaries, Webchats and Passport to Knowledge (P2K)*

Documentaries, Webchats, and "spotlight" reports will offer the public a "behind the scenes" look at the Cassini–Huygens mission. Geoff Haines-Stiles and Passport to Knowledge (P2K) have agreed to work with the Cassini–Huygens mission and the Exploratorium on a "Live From" program around the Huygens probe mission to Titan. P2K, producer of "Live from Mars 2002," is among Public Television's longest-running and most respected series of interactive science education projects.

*Public Mail*

Mail is a major component in communicating with our audience in the public and educational communities. To that end, Cassini–Huygens outreach has developed a detailed approach to handling speaker and product requests and answering e-mail questions. Cassini–Huygens will continue to develop ways to handle the immense amount of mail from the general public, by partnering with groups at local community colleges (who would gain their own personal connection to the mission by researching and answering mail for Cassini–Huygens), and by partnering with the Mars Program E/PO.

*The Internet*

Increasingly, the public finds its information through the World Wide Web. Therefore, the Cassini–Huygens Public Engagement Plan has created a user-friendly Web site to excite, enlighten, educate, and engage kids, educators, the general public, and the science community. It features comprehensive content, electronic messaging, an interactive site that includes an "electronic chalkboard" to support formal education outreach, Webcasts, and live Web events. Cassini–Huygens E/PO will continue to modify its Web site as the mission progresses from Saturn orbit insertion to the end of the mission, using the latest Internet technologies, leveraging the NASA portal, and involving our international partners.

The Cassini–Huygens Web site has experienced phenomenal growth since its initial release in 1995, and we expect that people will increasingly turn to it for detailed information about the Cassini–Huygens mission, its discoveries, and the spectacular pictures to come of Saturn, its rings, and its moons. Since debuting a new Web site in October 2002, Cassini has experienced the largest percentage growth in traffic of any Web site hosted on a JPL server. The number of visitors has averaged about 40,000 a month, with a peak at launch of 225,000 in one day. We expect that visits to the Cassini–Huygens Web site will continue to increase as the spacecraft approaches Saturn, and peak at Saturn orbit insertion and Huygens probe release.

The wealth of information that Cassini-Huygens will generate will need to be disseminated to the worldwide audience quickly and accurately. The Internet will be a major vehicle for doing that. We will also accommodate the need some areas may have for paper products to the extent that resources allow.

*"The Saturn Story" (Context for Mission Data)*

An important and challenging aspect of public engagement is to answer questions like "What does the data mean?" and especially "What does this mission do for me?" We will endeavor to explain the importance of the Cassini–Huygens mission and the meaning of its science data. We'll paint the whole picture of why we explore Saturn, in a way that is public-friendly yet comprehensive, to help people understand the images and other data in the context of the entire Saturn story.

"The Saturn Story" will be written and posted to the Web site prior to Saturn orbit insertion, and updated as new discoveries are made. The section of the Cassini–Huygens Web page where data from the Saturnian system is displayed will be organized and presented so that it furthers the telling of the story. A science journalism intern program will provide an opportunity for an emerging talent to contribute to this effort.

### Tasks Targeted for Scientist Involvement

- Scientists will review all products for scientific accuracy. (FY2002–FY2008).
- Scientists will conduct or participate in occasional star parties, helping large numbers of individuals to have the experience of seeing the Saturn system, including the rings and Titan, through telescopes. (FY2002–FY2007).
- Scientists will be the subjects of Cassini–Huygens Web site "Spotlights" to help the general public see the human side of Saturn system exploration. (FY2002-FY2008)
- ESA scientists will assist in the translation of a selected set of materials into French, Dutch, German, Italian, and Spanish languages. (FY2002–FY2008)

### Ongoing Efforts

The following efforts require periodic or ongoing support for the general public programs.
— Participation in public exhibition opportunities as events arise.
— Development of artwork and displays in support of public exhibitions opportunities.
— Travel and staffing requirements in support of public exhibition opportunities.
— Continued support, training, and recruitment of new Cassini–Huygens speakers.
— Development and production of materials (both for presentation and hand-out) in support of all general public activities.
— Training sessions for Solar System Ambassador participants.
— Creation of "spotlights" and other articles for use on the JPL Web site and in publications such as Astronomy magazine, *Sky & Telescope* magazine, *Highlights* magazine, and others.

### Timeline

See Appendix B, "Implementation Schedule," for timeline information on General Public Milestones.

### Evaluation

A state-of-the-art Web statistic software program will be used to assess Web site usage, including numbers of visitors, downloads, peak use, areas most visited, types of visitors (.com, .gov, .edu, etc.) and which search engines the public uses to visit the Cassini site. Data will be analyzed monthly, and the Web site will be updated to accommodate public needs and the requirements of ADA, 503 compliance, and the OSS education and public engagement best practices.

Assessment of the general public elements of the Cassini–Huygens outreach program will be completed in accordance with the goals and objectives set forth by CAPSI, through an agreement between the Cassini–Huygens program and CAPSI organizations.

## 3e. Media

### Overview

GOAL

In cooperation with the JPL Media Relations Office and the NASA Public Affairs Office, to make the mission's discoveries and science available to the widest possible audience.

OBJECTIVES

Provide words, pictures, and sounds about the mission, including its scientific goals and discoveries, to news media in the styles, formats, and delivery methods most likely to encourage the inclusion of accurate information in the material they present to the public.

RATIONALE

The media are important to the mission's public engagement strategy because they are powerful multipliers of outreach efforts. The media reach more people more efficiently than other communication methods.

### Target Audiences and Customers

At this stage of mid-project planning for Cassini–Huygens media relations efforts, our strategy draws heavily upon the formal Cassini–Huygens Public Affairs Plan drafted in 1996, amended in July 1999, and approved by NASA Headquarters. That document states, "While many programs of direct communication between NASA and the public (such as project Web pages) are valuable, experience has shown that the agency reaches by far the largest audience when it works together with commercial news media." Our targets include both generalized news outlets, such as daily newspapers and network television, and various types of specialized media.

Through general news media, we can reach an audience of people who pay attention to events beyond their social and workplace circles, and who elect to spend time reading, watching, or listening to the news. They are people who care enough about public policy and government spending to make an effort at being informed.

Through some types of specialized media, we can indirectly target nontraditional audiences for news about space exploration. For example, Spanish-language broadcasters and newspapers reach the growing Hispanic segment of the population. News media with other demographic targets help us convey our messages to groups such as young women or African Americans. Through another types of specialized media — outlets that feature science and technology news — we can target an audience already interested in and appreciative of space exploration. This is an efficient way for us to feed the curiosity and sustain the support of science fans.

Increasingly, the Internet is an important news medium in both the general and specialized categories. While the Cassini–Huygens mission "retails" information on its own Web site and other JPL and affiliated sites, it also "wholesales" information to news Web sites as it does to other types of news media.

## Themes and Messages

The major themes to be communicated to news media, and hence to the media's readers, listeners, and viewers, are those that give Cassini–Huygens a special appeal to a large cross-section of the public:

- Saturn is the jewel of the solar system. Cassini will be its first orbiter.
- Titan's thick atmosphere may resemble that of early Earth. Huygens will plunge through to its hidden surface.
- The rings are not only stunning visually, they may help tell solar system history.

The theme of the broad range of people involved in Cassini–Huygens has special news-media appeal. It makes Cassini–Huygens a local story in many communities, as well as an international and interplanetary story. And it gives minority groups an opportunity to identify with the mission by seeing some of their members excited about working on it.

Cassini–Huygens' scientific discoveries will feed the media's appetite for reporting what is new — what is known today that wasn't known yesterday. Studies of the atmospheres of Saturn and Titan will provide a tie-in to TV weathercasters for mentions of Cassini–Huygens observations. Technology spinoffs will spark stories about indirect benefits of the mission.

## Major Milestones, Activities, and Products

Several categories of products and activities that have already been used for Cassini–Huygens media relations work will continue to be useful throughout the mission, including press releases, press briefings, press kits, video files, animations, live shots and image releases.

*Press Kits, Fact Sheets, and News Releases*

At least two updated press kits will be prepared. One will be made available in early 2004, prior to the Phoebe flyby. It will provide news professionals with background information about the mission and the Saturnian system, and will outline expectations for the arrival at Saturn, Saturn orbit insertion, and the tour. Another will be made available in late 2004, prior to the Huygens probe descent, with increased emphasis on that aspect of the mission, as well as the remaining tour. The press kits will be distributed primarily via the Internet, but printed copies will be made available at media events.

The Cassini–Huygens fact sheet, accessible at the JPL Web site, will be kept up-to-date so it will continue to serve as a useful background reference for reporters preparing stories about the mission.

News releases and mission status reports, distributed primarily by Internet and fax, will inform the news media about new science results and mission events. Some media run the releases verbatim, but major news outlets use them as starting points for preparing their own reports. Approximately 50 to 70 Cassini–Huygens news releases can be expected through the end of the nominal mission.

Video files will accompany many of the press releases. They are packages of raw video material including animations, interview excerpts, data visualizations, and "B-roll" background footage, for newscasters to use in preparing their stories. The primary distribution method is NASA-TV's broadcast satellite. Approximately 30 video files can be expected through the end of the nominal mission. We will also offer satellite interview opportunities in connection with most of the video

file releases. An expert on the topic of the week can be interviewed live by many different broadcasters, scheduled back-to-back, via the NASA-TV satellite.

*Images and Animations*

Some pictures from Cassini's Imaging Science Subsystem, some audio presentations of data from the Radio and Plasma Wave Spectrometer, and some graphic data from other instruments will merit distribution with simply captions instead of accompanying news releases or video files. The news media made good use of releases like these during the Cassini–Huygens Jupiter flyby. They are distributed via the Internet.

One important set of products to be developed before arrival at Saturn is a collection of animated images portraying Saturn orbit insertion, the first Titan flyby, release of the Huygens probe, and the probe's descent to Titan. These animations should be the best possible quality, in versions compatible both with HDTV and standard TV formats.

*Media Events*

A media event with activities spanning two or three days will mark Saturn orbit insertion, scheduled for July 1, 2004. The first day will include a briefing about what to expect over the next two days and the next four years. Some Saturn images taken during previous days and weeks will be released. On the last day of the event, mission leaders will report on Saturn orbit insertion performance, and may release images of the rings. A European site may be linked by satellite to assist European news media.

A one-day media event with a press briefing is planned for the October 26, 2004, Titan flyby. Europe will host the primary press activity for the Huygens descent, but JPL will have a satellite-linked event for U.S. media.

Throughout the rest of the tour, press briefings will be scheduled at JPL in connection with significant mission events, and at JPL, NASA HQ, or other sites to report major scientific findings from the mission.

Sessions with professional media trainers in advance of expected news coverage will help selected Cassini–Huygens personnel polish their abilities to get their points across during press interviews and briefings. The training will help us take advantage of the ethnic and linguistic diversity of the Cassini–Huygens team in presenting the mission's face to the public.

## Partners and Collaborators

An Associated Press science reporter, Andrew Bridges, and a science/aviation reporter for KCBS-TV, Kent Shocknek, met with the media-relations work group to discuss how the mission and media could work together to get Cassini–Huygens news to the public.

The European Space Agency's media-relations group is coordinating plans for mission news strategies and events.

The NASA HQ Public Affairs Office is a partner and overseer in the distribution of Cassini–Huygens news products. Many news releases go through the headquarters newsroom and are released first by headquarters. The video-file distribution and live-shot opportunities depend on cooperation with NASA-TV.

University public information officers at institutions with Cassini–Huygens scientists collaborate on news releases and press briefings. Their involvement strengthens contacts with local media outlets in many communities and helps to make Cassini–Huygens a local story for those newspapers and broadcasters.

## Scientist and Engineer Involvement

Scientists are essential partners in bringing potentially newsworthy research results to the attention of the JPL Media Relations Office in a timely manner, either directly or through the project scientist or deputy project scientist. Press briefings will provide direct contact between reporters and the scientists, engineers, and project managers, who will be the main sources quoted in news stories and interviewed for broadcasts. Sessions with professional media trainers in advance of expected news coverage will help selected Cassini–Huygens personnel polish their abilities to get their points across during press interviews and briefings. The training will help us take advantage of the ethnic and linguistic diversity of the Cassini–Huygens team in presenting the mission's face to the public.

## Targets of Opportunity

Part of effective publicity work is seizing opportunities for greater coverage by responding to the initiatives of media personnel. News reporters, documentary makers, book authors, and others who approach JPL for assistance will be given every reasonable access to Cassini–Huygens scientists, managers, images, and information. Responding promptly to such requests is a high priority for the JPL Media Relations Office.

## Timeline

See Appendix B, “Implementation Schedule,” for timeline information on Media Milestones.

## Evaluation

The JPL Media Relations Office currently clips some of the media’s reports about news from JPL. This gives some indication of which topics get the most play, but is not a reliable way to estimate total news coverage. The office is currently reviewing its tracking of media coverage. Metrics and assessment of Cassini–Huygens coverage should be accomplished as part of the system developed for the Laboratory as a whole.

## APPENDIX A

## Implementation Schedule

***Cassini–Huygens Public Engagement Consolidated Program Element Timeline***

| *Dates* | *Activity* |
|---|---|
| **Formal Education K–4 Timeline** | |
| July 2001–2002 | BAWP, Project FIRST, and CAPSI develop plan with rubrics, articulated to the standards quilts and training, pilot in spring 2002 in selected classrooms including observing Saturn with the unaided eye. |
| July 2002 | Two-week workshop for selected participants to build the first unit of the K–4 program. Workshop will be coordinated between BAWP, Project FIRST, CAPSI, and JPL. |
| July 2002–2003 | Training packet in final form, professional development of participant teachers, pilot in classrooms, evaluation of materials, presentation at conferences (NSTA, Language, Supervisors), design distance learning training model. |
| July 2003 | Final release of tested first unit. |
| July 2003 | Second two-week workshop to build the second unit of the K–4 program. |
| July 2003–2004 | Wide-area dissemination, summer training via distance learning and area conferences. Publicity for Saturn orbit insertion. Continued evaluation and enhancement of materials based on results of surveys, evaluation, and advancements in best practice. |
| July 2004 | Final release of tested second unit. |
| July 2004–continuing | New Saturn discoveries provide material for continued writing and connection to Earth (life of student). |
| **Formal Education 5–8 Timeline** | |
| Aug 2001–Jan 2003 | Meet with partners (Pat Reeder, GAVRT), design scope and themes plan using rubrics, articulated to standards quilt of interdisciplinary units. Meet with Cassini–Huygens team, review relevant materials from those already created (Ways of Seeing, Saturn Educator Guide, Saturn in the Kitchen, Passage to a Ringed World) and current data, including observing Saturn with telescope to use in design of unit. |
| Jan–July 2003 | Gather team of 5–8 teachers, design initial interdisciplinary unit with GAVRT Saturn observation as part. |
| July –Dec 2003 | Training packet in final form, training of participant teachers, including the Solar System Educators Program participants; pilot in classrooms; evaluation of materials; presentation at conferences (NSTA, Language, Supervisors, NCTM, etc.); design distance learning training model. Recruitment of teachers to enlarge pilot project. |

| *Dates* | *Activity* |
|---|---|
| Jan –July 2004 | Wide-area dissemination, summer training via distance learning and area conferences. Publicity for Saturn orbit insertion. Continued evaluation and enhancement of materials based on results of surveys, evaluation and advancements in best practice. New interdisciplinary units created by participating teachers. |
| July 2004–continuing | New Saturn discoveries provide material for continued writing and connection to Earth (life of student) and creating of new interdisciplinary units. |
| **Formal Education 9–14 Timeline**<br>TBD Summer 2004 | |
| **Informal Education Milestones** | |
| April 2002 AO; shows 2003 | Saturn/Cassini Updateable Planetarium Show |
| Sept 2003–July 2004 | Star Party Schedules and Content Development |
| October 2003–2005 | Multimedia Kit Dissemination for Planetarium Show |
| Sept. 2003–Jan 14, 2005 | Probe Mission Museum Webcast Experience (start FY03) — Live, immersive global experience of return of Huygens probe data, presented via a national network of museums who stage their own local versions of the experience for the general public, youth groups, etc. |
| Oct 2003–2006 | Slide update and dissemination (start FY03) |
| **Youth Groups/ Diversity Milestones** | |
| Dec 2003 | Release funds for Project Roadmap, develop math-based content for publication. |
| Oct 2002–Oct 2003 | Training Program for Youth Leaders, focus on GSUSA and 4-H. |
| Oct 2002–Oct 2003 | Develop materials and content to support diverse speakers and mentors. |
| Dec 2002-June 2003 | Develop and distribute materials for Community Nights throughout nation. |
| **General Public Milestones** | |
| Oct 2001–2002 | Development of the Web-based Saturn Observation Campaign and introduction of this program on the Cassini–Huygens Web site. |
| June 2002–2003 | Campaign has begun and further development of Saturn Observation Campaign. |
| Oct 2002–2003 | Formal announcement and rollout of Saturn Observation Campaign. |
| Jan–July 2002 | Development of timeline for publication of "spotlights," articles, and general support materials with respect to the Saturn viewing opportunities and the mission events. |

| *Dates* | *Activity* |
|---|---|
| Jan –July 2004 | Cassini tour and Huygens mission training programs for Solar System Ambassadors Program. |
| Jan 5, 2004 | Web-based support of general public activities in relation to the Huygens probe mission. |
| July 2004–continuing | Ongoing support of general public programs in response to the continuing success of the Saturn tour. |
| **Internet Milestones** | |
| Sept 2001 | Create snapshot of current Cassini–Huygens Web site. All future changes and updates to current site are to be logged and integrated into new site design. |
| Sept–Dec 2001 | Transition current site to new environment, including CD, photos, tapes, printed material, images, historical information, mailing list. Responsible for monthly and email responses to Cassini–Huygens Webmaster. |
| Oct 2001–Jan 2002 | Gather engineering and content requirements for Web site redesign. |
| Jan 2002 | Begin re-engineering and redesign for new Cassini–Huygens Web site. |
| Feb–May 2002 | Begin working with several Cassini–Huygens PIs to formulate a dedicated area for data and instrument information. |
| March 2002–June 2002 | Structure and content from old site begins to populate new page in development. |
| March 2002–June 2002 | Formal, informal, diversity, public working group content and structure build. |
| June 2002 | Alpha Test phase |
| July 2002 | Beta Test, roll-out for internal review. |
| September 2002 | Deploy new Cassini–Huygens Web site. |
| Sept–Dec 2002 | Population of Saturn Observation and Planetary Study; create the vision of "seeing" the destination using ground-based observation. Theme: Answering why we are sending a spacecraft to explore Saturn and its rings and moons. Spotlight: Saturn: The Jewel of the Solar System. |
| Jan–April 2003 | Spacecraft and the role of the instruments: showcasing an instrument a month and the people who belong with it. Theme: Robotics and their humanlike features; seeing through multiple eyes. Spotlight: 'Bots in Space: Going Where We Can't. |
| May–August 2003 | Preparation for Titan: The Shrouded Moon. Feature an instrument from the probe a month and the people either here or at ESA associated with it. Opportunity to educate applications of RADAR (Venus, Earth, Mars). Theme: Answering what are we going to do once we arrive; Destination – Titan. Spotlight: Amazing Science at Saturn; Ways of Seeing Through the Eyes of RADAR (comparisons of Venus, Earth, Titan). |
| Sept 2003–July 2004 | Saturn approach — data acquisitions begin Jan 04. This is the period where the greatest images acquired of Saturn will occur. Images will be coming in possibly daily. Possibility: do weather comparisons of Titan, Venus, Earth, Jupiter, even Neptune. "Meteorologists" section for news weatherman to do reports on the evening news. Theme: Preparing for SOI and ring-plane crossing; data on Titan's atmosphere; studying winds for a safe landing. Spotlight: Meteorologists Alert!; Ballooning on Titan; Saturn in Our Sights / The Approach Begins; Cassini, Master of the Rings. |
| July 4, 2004 | Saturn arrival — streaming media event, live chats, frequent updates daily on the Web site. Theme: SOI – ring-plane |

| *Dates* | *Activity* |
|---|---|
| | crossing. Spotlight: Journey Through the Rings. |
| Oct 10, 2004 | First Titan encounter. Theme: Shrouded moon. Spotlight: Eyes on Titan. |
| Nov 27, 2004 | Second Titan encounter. Theme: Shrouded moon. Spotlight: ESA and the Huygens Probe. |
| Dec 25, 2004 | Huygens probe release — streaming media, sound files/interviews with PIs capturing the anticipation and excitement. Theme: A Christmas present for Titan / countdown to Titan. Spotlight: Sending a Package via Spacemail; The Mechanics of the Journey. |
| Jan 14, 2005 | Huygens probe delivery at Titan. Joint project with ESA and exploratory. Theme: Key event at ESA – streaming media or current technology for press exposure. |
| Sept 2004–July 2008 | Continuous updates to Web site: discoveries, feature stories, events, and outreach involvement. Theme: The Saturnian system; connection to the solar system. |
| Sept 2007–2008 | Will there be an extended mission and what will Cassini be doing? Has Cassini–Huygens inspired new mission proposals? Theme: Cassini–Huygens legacy; the cumulative nature of science. |
| **Media Milestones** | |
| Ongoing | At least two updated press kits will be prepared. One will be made available in early 2004, prior to the Phoebe flyby. It will provide news professionals with background information about the mission and the Saturnian system, and will outline expectations for the arrival at Saturn, Saturn orbit insertion, and the tour. Another will be made available in late 2004, prior to the Huygens probe descent, with increased emphasis on that aspect of the mission, as well as the remaining tour. Approximately 50–70 Cassini news releases and mission status reports, distributed primarily by Internet and fax, will tell the news media about new science results and mission events. |
| FY04–FY08 | Approximately 30 video files will be prepared to accompany many of the news releases. They are packages of raw video material, including animations, interview excerpts, data visualizations, and b-roll background footage, for use by newscasters in assembling their accounts. Live shot satellite interview opportunities will be offered in connection with most of the video file releases. An expert on the topic of the week can be interviewed live by many of different broadcasters, scheduled back-to-back, via the NASA-TV satellite. |
| FY04 | A media event with activities spanning two or three days will be planned for the time of Saturn Orbit Insertion, July 1, 2004. A European site may be linked by satellite to assist European news media. |
| FY05 | A one-day media event with a press briefing will be planned for the time of the Oct. 26, 2004 Titan flyby. |
| FY05 | Europe will host the primary press activity for the Huygens descent on January 14, 2005. JPL will have a satellite-linked event for U.S. media. |
| FY04–FY08 | Throughout the rest of the tour, press briefings will be scheduled at JPL in connection with significant mission events, and at JPL, NASA HQ, or other sites to report major scientific findings from the mission. |

| *Dates* | *Activity* |
|---|---|
| FY03 | To be developed before arrival at Saturn: new animations portraying Saturn orbit insertion, the first Titan flyby, release of the Huygens probe, and the probe's descent to Titan. These animations should be the best quality possible, in versions compatible both with HDTV and standard TV formats. |
| FY03–FY07 | Sessions with professional media trainers in advance of expected news coverage will help selected Cassini personnel polish their abilities to get their points across during press interviews and briefings. The training will help us take advantage of the ethnic and linguistic diversity of the Cassini team in presenting the mission's face to the public. Image releases from Cassini instruments, posted to news media but no video-file production. Online fact sheet maintained with up-to-date information for news media's reference. |

## APPENDIX B

## Cassini–Huygens European Public Outreach Working Group (CHEPOWG)

***CHEPOWG Members***

| *Name* | *Organization* |
|---|---|
| Michele Dougherty | Imperial College, London |
| Tilman Denk | DLR, Berlin |
| Enrico Flamini | Agenzia Spaziale Italiana, Roma |
| Amara Graps | MPI, Heidelberg |
| Gerard Huttin | Alcatel, Cannes |
| Jean-Pierre Lebreton | Space Sciences Dept of ESA, Noordwijk |
| Jose J. Lopez-Moreno | Inst de Astrofisica de Andalucia, Granada |
| Sylvestre Maurice | OMP, Toulouse |
| François Raulin (Lead) | Laboratoire Inter universitaire des Systèmes Atmosphériques, Creteil |
| John Zarnecki | Open University, Milton Keynes |

# APPENDIX C

## Cassini–Huygens Re-Plan Team Leads

*Eva Graham, Jet Propulsion Laboratory (Diversity)*

Eva Graham is the Manager for Minority Education Initiatives Office (MEIO), a group within the JPL Education Office. MEIO is responsible for JPL's response to the Presidential Executive Orders on Historically Black Colleges and Universities, Hispanic Serving Institutions and Tribal Colleges and Universities. The group also serves as a support system for mission-based educational outreach programs targeting underrepresented and underserved communities. The activities supported by MEIO include a series of summer internship programs hosting a national pool of students from the pre-college to the graduate level, a local pre-college tutoring/mentoring program (JPL Pasadena Unified School District [PUSD] Math and Science Centers), support for a local after-school program (LA's BEST), summer internship opportunities for high school teachers (JPL Teachers Program), bridge programs for colleges and universities (Compton Community College MESA Bridge Model and ALVA). The team also hosts an advisory group on Minority Education Initiatives activities that meets weekly in an effort to secure partnerships and leverage resources (both internal and external to JPL) in support of activities in underrepresented communities. Eva's responsibilities include being the Point of Contact for Minority Education at JPL for NASA Headquarters (formerly Code EU) and JPL senior management. The MEIO team is also responsible for the "Executive Summary" (formerly the "White House Report") to Headquarters. Eva began at JPL as a Summer Undergraduate Research Fellow (SURF) and spent eight years in the Thermal Propulsion and Engineering section. She spent three years as a science teacher at Berkeley High School in Berkeley, California, and two years as the Director of Outreach, Recruitment, and Enrollment at the National Action Council for Minorities in Engineering (NACME) in New York City. Eva holds undergraduate and graduate degrees in chemistry from Xavier University of New Orleans and Tuskegee University, respectively. Currently she represents JPL on the PUSD Partners in Education Board and Los Angeles Trade Technical College Chemical Technology Alliance. She believes that her greatest accomplishment and challenge to date is her four-year-old son, Roy.

*Art Hammon, Jet Propulsion Laboratory*

Art Hammon is a Precollege Education Specialist at JPL. He was a public school teacher for 28 years, having taught chemistry, physics, and French at middle and high school levels. Art is a national trainer for the Operation Physics Program, Chair of the New Hampshire Legislature Distance Learning Commission, and a curriculum designer for the Caltech Precollege Science Initiative (CAPSI). He has graduate degrees in chemistry and French. Art is the recipient of a Presidential Award in Science Teaching and a Distinguished Faculty Award from the University System of New Hampshire.

*Christopher Hawley, Jet Propulsion Laboratory (Internet)*

Chris Hawley is the Contract Technical Manager for the Raytheon Dynamic Media Group.

*David Overoye, Manager, Raytheon Dynamic Media Group (Internet)*

David Overoye is manager of Raytheon's Dynamic Media Group. He has been involved with the Internet and multimedia since writing and producing "The Video Guide to the Internet" in 1994. He has led numerous seminars in the United States and abroad on the use of the Internet for business and education. His awards include Top 100 Media Producers of 2000, and an International Silver CINDY for producing the interactive CD "Seeds of Peace." The Raytheon Dynamic Media Group consists of graphic designers, programmers, writers, DBAs (Doing Business As), and multimedia experts who produce and maintain a large number of Web sites and CD-ROMs for JPL and NASA, including some of JPL's most popular sites: mars.jpl.nasa.gov, solarsystem.nasa.gov, and the Cassini–Huygens Web site — saturn.jpl.nasa.gov. Sites maintained, and/or designed by the team generated nearly 1/2 billion hits last year for NASA.

*Rebecca Knudsen, Jet Propulsion Laboratory*

Rebecca Knudsen works for both the Office of Education and Public Outreach at JPL and for the OSS Solar System Exploration E/PO Forum. She specializes in educational research and evaluation, with a focus on trends in the K–12 classroom. Some of her research interests include educational technology, curriculum standards correlation, and educational needs assessment. She received a B.S. in psychology from Brigham Young University, and is currently pursuing graduate studies at Loma Linda University.

*Leslie Lowes, Jet Propulsion Laboratory*

Leslie Lowes is the co-director for NASA's Solar System Exploration Education and Public Outreach Forum, co-led by Dr. Ellis Miner and managed at JPL. She started her outreach career in 1996 as the Galileo mission to Jupiter Lead Outreach Coordinator, getting in on the early days of OSS development of E/PO as a profession. With the support of Galileo project management, she started the Galileo Ambassador to Jupiter program in 1997, which has since grown and evolved into the highly successful Solar System Ambassador program, expertly managed by Kay Ferrari with over 300 Ambassadors nationwide. Leslie attributes the SSE Forum's success to her highly talented staff and co-director, the support of the JPL Education and Public Outreach Office (Dr. Parvin Kassaie), the SSE E/PO community, the influence of the wider OSS E/PO Support Network, and to a philosophy of asking and listening to our customers when planning our goals and activities. As an additional duty, Leslie Lowes and the Solar System Exploration Forum helped facilitate the Cassini public engagement re-plan efforts, culminating in the Cassini Public Engagement Plan design review in March 2002.

*Shannon McConnell, Jet Propulsion Laboratory*

Shannon holds dual positions at the Laboratory. She is the lead for the Galileo Outreach Office and is the Education Coordinator for Cassini–Huygens. Shannon has a decade of experience at JPL. She began her career as a data analyst for the Magellan Venus Mapper. She then held positions with the Galileo to Jupiter project, the Spaceborne Imaging Radar project, and the Cassini–Huygens Saturn project. Before joining outreach, Shannon worked in mission planning and RADAR science for Cassini–Huygens. Shannon received a Bachelor's Degree in astronomy and physics from the University of Southern California (USC) and a Master's Degree in Environmental Engineering, also from USC. Besides her experience at JPL, Shannon spent three years as a junior high teacher and was the department teaching assistant for the Astronomy Department at USC. Shannon's favorite experience while at JPL was working in Mission Control

at Johnson Space Center during the two shuttle flights of the Spaceborne Imaging Radar in 1994. She likes to sing, ski, and play volleyball, and she is a football enthusiast. Shannon enjoys traveling and has visited over 30 countries on 6 continents. She is a member of the Pasadena Tournament of Roses.

*Ellis Miner, Jet Propulsion Laboratory*

Dr. Miner has been involved in robotic exploration of the planets for the past 35 years. As a space scientist at the Jet Propulsion Laboratory, he has vicariously visited all of the planets in the solar system except Pluto. Dr. Miner has been a team member on a number of missions — the infrared science investigations carried aboard the Mariner 6 and 7 flybys of Mars, the Mariner 9 orbiter of Mars, the Mariner 10 flybys of Venus and Mercury, the Viking 1 and 2 orbiters of Mars, and the Voyager 1 and 2 flybys of Jupiter. In a broader scientific role, he served as the Assistant Project Scientist for the Voyager 1 and 2 missions to Saturn, Uranus, Neptune, and beyond. He is currently Science Advisor for the Cassini–Huygens mission to Saturn and Titan and co-director of NASA's Solar System Exploration Education and Public Outreach Forum, with Leslie Lowes. He is a member of the JPL Speaker's Bureau and has given more than 400 talks on astronomy and the space program over the past 20 years. He has authored or co-edited three books on Uranus and is presently co-authoring a book on Neptune. Dr. Miner received his B.S. in physics from Utah State University in 1961 and his Ph.D. in astrophysics and spectroscopy from Brigham Young University in 1965. He and his wife Beverly Allen have seven children and eleven grandchildren. They are active in civic and church affairs. Dr. Miner spent 30 months as a missionary in Germany for the Church of Jesus Christ of Latter-day Saints, served twice as a Bishop for the Church, and is presently serving as First Counselor in the Stake Presidency of the La Crescenta California Stake of the Church.

*Guy Webster, Jet Propulsion Laboratory*

Guy Webster has publicized mission events and science results of the Galileo and Cassini–Huygens missions since joining JPL as a media relations representative in 2000. His familiarity with the news media's needs and preferences comes mainly from covering science, environment, and other beats as a reporter for daily newspapers in Arizona for 16 years. His experience in education and public outreach also includes seven years at the University of Arizona as an information specialist for the Cooperative Extension Service, a federal-state-county partnership dedicated since 1914 to bringing science-based information to the public. As background helpful in understanding scientists' perspective about communicating science to the public, he co-authored a half dozen biochemistry research papers in peer-reviewed journals while working for two years in a laboratory at Tufts University School of Medicine. His degree in journalism is from the University of Minnesota.

*Alice Wessen, Jet Propulsion Laboratory*

In her current responsibility as Manager for Solar System and Technology Outreach at NASA's Jet Propulsion Laboratory, Alice Wessen leads a team of outreach professionals towards creating effective and well-leveraged communications to tell the story of space exploration and share its discoveries with the nation. Previously she was the Outreach Lead for the JPL Technology and Commercial Technology Program, working with the private sector and the NASA Incubation Center in Pomona. She has led the development of partnerships with several non-profits and commercial entities, including an NSF-funded "Extreme Life" exhibit at the New York Hall of

Science, International Storytelling Institute, and The Tech Museum of Innovation. Under her leadership, technology-related press increased five-fold, and JPL leads NASA in technology-related stories.

Prior to her work with JPL, she established the primary outreach vehicle for the Los Angeles Superior Children's Court, "A New Beginning for Children and Families in Los Angeles County" annual conference. The main focus of this conference was to bring together the multitude of agencies in the Los Angeles County region who deal with issues related to child and family welfare, abuse, and foster care.

In her career, she has worked as a senior financial and marketing analyst with such Fortune 500 companies as Avery International, Pillsbury, City National Bank, Broadway Department Stores, and TRW, and as the Business Manager for Student Programs at CSULA. Alice Wessen has a Bachelor's degree in Science, with a Marketing and Finance emphasis, and a Master's degree in Education, with a focus on at-risk populations.

# APPENDIX D

## External Planning Advisors

***Exernal Planning Advisors Names, Affiliations, and Areas of Expertise***

| *Name* | *Organization* | *Expertise* |
|---|---|---|
| Al Hovey | North Central Regional Educational Laboratory (NCREL) | Formal Education — Interdisciplinary Learning |
| Lisa Rothenburger | 4-H Clubs | Informal Education —Youth Groups |
| Ben Burress | Chabot Space and Science Center | Science Museums and Science Centers |
| Martin Ratcliffe | International Planetarium Society | Planetariums |
| Dr. Constance J. Johnson | National Resource Center for the Healing of Racism | Diversity |
| Vernon Morris | Howard University | Formal Education — Atmospheric Chemistry; Scientist Involvement |
| Lee Siegel | (formerly) Associated Press | Print Media – Science Journalism |
| Geoff Haines-Stiles | Passport to Knowledge | Informal Education/Media – Video Format |
| Randal Jackson | (formerly) cnn.com | Internet/Media |
| Ruth Guthrie | California Polytechnic University at Pomona | Internet Usability and Accessibility |

## Biographies

*Ben Burress, Chabot Space and Science Center*

Benjamin Burress earned a bachelor's degree in physics, with an astronomy minor, from Sonoma State University in Rohnert Park, California. Following graduation, he served for two years in the U. S. Peace Corps as a secondary school physics and mathematics teacher in Cameroon, West Africa. Upon returning home, Mr. Burress signed aboard NASA's Gerard P. Kuiper Airborne Observatory (KAO) as an observing assistant to guest investigator teams. During his term on the KAO, Mr. Burress worked with Project FOSTER, an E/PO program that brought schoolteachers on board during research flights. Following the closing of the KAO program, Mr. Burress went to Lowell Observatory in Flagstaff, Arizona, to work as head observer for the Naval Prototype Optical Interferometer. In July of 1999, Mr. Burress returned to the Bay Area to work at Chabot Space & Science Center where he has been managing an E/PO grant from Lockheed Martin Missiles and Space, developing online materials for the CSSC Web site, developing exhibits and public outreach kiosks, and developing/presenting at CSSC teacher training workshops.

*Ruth Guthrie, Associate Professor, Computer Information Systems Department, California Polytechnic University of Pomona*

**(**Bio not available.)

*Geoff Haines-Stiles, Passport to Knowledge*

Geoffrey Haines-Stiles is one of America's most experienced producers of science television programming. He was Senior Producer/series director for Carl Sagan's Emmy award–winning *Cosmos* series, creative consultant for Lily Tomlin's feature film, *Search for Signs of Intelligent Life in the Universe*, and producer-director of the AAAS-Westinghouse science journalism award-winning *Creation of the Universe* by Timothy Ferris. For the past eight years he has been Project Director for *Passport to Knowledge* (P2K), which has delivered nearly 100 hours of innovative interactive science programming from the Amundsen–Scott South Pole Station, the heart of the Amazon rainforest, and live from the stratosphere aboard NASA's Kuiper Airborne Observatory. P2K projects, supported in part by grants from NASA, NSF, NOAA, and others, appear on PBS stations nationally, reaching millions of students and teachers, and are accompanied by award-winning Web sites and project-based hands-on activities.

*Alfred A. Hovey, Jr., North Central Regional Educational Laboratory (NCREL)*

Al currently serves as a Program Associate for the North Central Mathematics and Science Consortium (NCMSC), which is part of the North Central Regional Educational Laboratory (NCREL). He covers seven midwestern states assisting, training, and providing professional development and technical assistance to classroom teachers, administrators, and other educators, and helps identify and disseminate exemplary mathematics and science education resources. Telecommuting from his home office is definitely a new experience. Al also is consulting for the Wauwatosa School District. Previously Al spent 24 years teaching in Shawano, five years as Wisconsin State Science Education Consultant, and six years in Wauwatosa before retiring (?) from the classroom. He is, and has been involved with, science at the local, state, and national levels. He has received numerous awards, including the Ron Gibbs award; has served as President of the Wisconsin Society of Science Teachers, and is presently their liaison to various groups; has worked on the Wisconsin Science Standards; and has served on testing and many other committees. His goal is to collaborate and establish strategic partnerships with educational entities, including state departments of education, other consortia/labs, the Eisenhower National Clearinghouse, and national science organizations.

*Randal K. Jackson (formerly CNN.com)*

Randal Jackson is Internet/New Media Architect for the JPL Navigator program. Before joining JPL, he was a senior editor for CNN.com, overseeing the site's science and technology coverage. He spearheaded CNN.com/Space, one of the most popular sites on the Web devoted to space news and information. His previous experience as a print journalist includes a decade of community and daily journalism experience. As a writer and editor for CNN, he has been involved in the coverage of such stories as the Pathfinder mission to Mars, the deorbiting of the Mir space station, and construction of the International Space Station.

*Constance J. Johnson, National Resource Center for the Healing of Racism*

Dr. Constance Johnson helps to transform organizations and communities through the Oneness of Humankind. Her personal mission is to expose as many people as possible to healing racism, and promote the services and resources that exist to help change the lives of people in education, business, government, and the community. Working with students at the college and university level as the Dean of Women, Associate Dean of Students, Director of Enrollment Development, and as a mentor, she provided counseling and insights into the needs of young people about racism. Dr. Johnson has managed aerospace logistics planning support teams with budgets of over $10 million. She has developed and facilitated seminars on leadership, customer service, diversity, and conflict management. She is a recognized storyteller and enthralls those who listen. Constance has over 20 years in providing marketing and management expertise to both business and educational institutions. She graduated from Central State University with a Bachelor of Science in Business Administration, Central Michigan University with a Master of Science in Business Administration, and the University of Cincinnati with a Doctor of Education in Sociological and Philosophical Foundations of Education. She has also had extensive training in healing racism, managing diversity, and multicultural education.

*Martin Ratcliffe, International Planetary Society*

Martin is President of the International Planetarium Society (2001–2002) and Director of Theatres and Media Services at Exploration Place and has been involved in all aspects of program development for the Boeing CyberDome Theater and the Simulation Center. The CyberDome theater continues development of fully interactive shows in immersive domed theatres. Prior to moving to Wichita, he directed the Buhl Planetarium at the Carnegie Science Center in Pittsburgh, PA, from 1991 to 1997. Martin co-developed the world's first interactive Planetarium in Armagh, Northern Ireland. Martin is an accomplished writer and monthly columnist for the national magazine Astronomy. He also films total eclipses of the Sun for television and enjoys astrophotography. He is a past Council member of the British Astronomical Association. He earned a Bachelor of Science degree from University College London (England) in Astronomy. Martin is an adjunct professor of Astronomy at Baker University in Wichita, Kansas.

*Lisa S. Rothenburger, Rutgers University, Rutgers Cooperative Extension/4-H Youth Development*

Lisa Rothenburger has 16 years experience as a science educator. She has worked for a science museum, a nature center, and taught middle school science. Since 1997, she has been the 4-H County Agent in Somerset County, New Jersey. She received a BA from Clark University and an MAT from the University of Louisville, both in Biology. Her love for space started when she received training on "Starlab" and became hooked. She spent a year conducting simulated space missions for a Challenger Center. As a 4-H Agent, Lisa has participated as a Solar System Ambassador. She has also started many astronomy programs for the youth in New Jersey. She has created 4-H astronomy clubs for youth, conducted star-gazing sessions, created hands-on workshops for youth and adults, and helped coordinate the efforts of close to 50 volunteers to continue and expand these programs. She continually seeks new collaborations and ideas in order to produce educational and public outreach material and programs.

*Lee Siegel, University of Utah, Public Relations/News Specialist*

Lee Siegel, a native of Portland, Oregon, is a science news specialist for University of Utah Public Relations. He is a graduate of the University of Oregon and earned a master's degree at the Columbia University School of Journalism in New York. He began his career working for newspapers in Washington state (1976–1981), and was a member of the staff of The Daily News of Longview, Washington, when the staff won a Pulitzer Prize for coverage of the 1980 eruption of Mount St. Helens. Siegel joined the Associated Press in Seattle in 1981, then in 1982 transferred to the AP's Los Angeles bureau, where he served as one of the wire service's national science writers during 1984–1993. Siegel was science editor for The Salt Lake Tribune during 1993–2000, a science writer for SPACE.com for a few months in 2000 before mass layoffs at that company, and then joined the University of Utah in December 2000. With University of Utah geophysicist Robert. B. Smith, Siegel is co-author of *Windows into the Earth: The Geologic Story of Yellowstone and Grand Teton National Parks*, Oxford University Press, 2000.

## APPENDIX E

## Literacy Partners — Background and Biographies

***California Writing Project/ Bay Area Writing Project (BAWP)***
http://www.bayareawritingproject.org/
Director: Carol Tateishi — tateish@uclink4.berkeley.edu
Bay Area Writing Project
5511 Tolman Hall #1670
University of California
Berkeley, CA 94720-1670
Telephone: (510) 642-0971

BAWP is a collaborative program of the University of California at Berkeley and Bay Area schools, dedicated to improving writing and the teaching of writing at all grade levels and in all disciplines. The Project includes an expanding network of exemplary classroom teachers, kindergarten through university. Throughout the summer and the school year, this network of teachers conducts professional development programs for teachers and administrators.

As the flagship site of the National Writing Project; BAWP's program model and design are replicated at 160 colleges and universities throughout the country and at five sites internationally.

The Bay Area Writing Project was established in 1974 in the Graduate School of Education on the Berkeley campus. Each year, close to 4,000 teachers participate in BAWP summer and school-year programs. For many, BAWP remains a resource throughout their teaching careers. BAWP's commitment to the professional growth of teachers is key to the high-level of interest by classroom teachers and to their enduring support.

***National Writing Project***
http://writingproject.org/index.html
University of California
2105 Bancroft, #1042
Berkeley, CA 94720-1042
Telephone: (510) 642-0963
Fax: 510-642-4545
E-mail: nwp@writingproject.org

The National Writing Project (NWP) is a nationwide professional development program for teachers, begun in 1974 at the University of California, Berkeley. The primary goal of the project is to improve student writing achievement by improving the teaching of writing in the nation's schools. The NWP receives federal funding, which it currently grants to 175 local sites in 50 states; Washington, D.C.; Puerto Rico; and the U.S. Virgin Islands. Sites operate from university campuses and collaborate with surrounding schools and districts. Collectively, these sites serve approximately 100,000 teachers every year, grades kindergarten through university, in all disciplines. The NWP model is based on the belief that teachers are the key to education reform,

teachers make the best teachers of other teachers, and teachers benefit from studying and conducting research.
The mission of the NWP is to improve the teaching of writing and improve learning in the nation's schools. Through its professional development model, the NWP recognizes the primary importance of teacher knowledge, expertise, and leadership.

The NWP believes that access to high-quality educational experiences is a basic right of all learners and a cornerstone of equity. Through its extensive network of teachers, the NWP seeks to promote exemplary instruction of writing in every classroom in America.

The NWP values diversity — our own as well as that of our students, their families, and their communities. We recognize that our lives and practices are enriched when those with whom we interact represent diversities of race, gender, class, ethnicity, and language.

The NWP is supported primarily by a grant from the US Department of Education (www.ed.gov).

***Project FIRST***
http://www.eyeonthesky.org/index.html
Director: Ruth Paglierani — ruthp@ssl.berkeley.edu
Center for Science Education @ Space Sciences Laboratory, UC Berkeley
Grizzly Peak at Centennial Drive
MC 7450
Berkeley, CA 94720-7450
Telephone: (510) 643-5669
Fax: (510) 643-5660

The Director of Project FIRST, Ruth Paglierani, is a member of the Science Education Group at the UC Berkeley Space Sciences Laboratory, where she has worked extensively in UC Berkeley community outreach efforts in conjunction with the UC Berkeley Pledge and the Interactive University Project. At present she is the director of Project FIRST. Her recent efforts have been focused on building school/university partnerships to develop age-appropriate space science teaching materials for the elementary grades. She received her Bachelor of Arts degree from the University of California at Berkeley and earned her teaching credential in the UC Berkeley Graduate School of Education. She holds a master's degree in English with an emphasis in language acquisition from San Francisco State University.

***Caltech Precollege Science Initiative (CAPSI)***
http://www.capsi.caltech.edu/
http://www.search.caltech.edu/departmental_directory/Caltech_Precollege_Sc.html
Director of the Pasadena Center for Teacher Enhancement at CAPSI: Laurie Thompson

The Caltech Precollege Science Initiative is a collaborative effort linking scientist and engineering professionals with educators, teachers, and school administrators.

We began with an emphasis on the needs of the youngest children, in grades K–6, because they begin school as natural scientists. If this beginning is nurtured and built upon, these children will

become scientifically literate citizens, and some will also become needed science and engineering professionals.

In collaboration with the teacher preparation program at Claremont Graduate School of Education (with NSF support), we developed a college science course primarily aimed at elementary school teachers, but which in fact will be a solid foundation for specialist teachers as well as non-teacher liberal arts students. The course has dual topical strands in biology (plant growth and development) and physics (sound) and was developed by a team of teachers, teacher-educators, and research scientists, combining their individual expertise to create a hands-on cooperative learning experience. The subject matter is sophisticated, but the pedagogy is relevant for science teaching at any grade level, K–16.

The Director of the Pasadena Center for Teacher Enhancement at CAPSI, Laurie Thompson, will be collaborating with the CAPSI Research Team for the next three years on an NSF-funded study on the effects of using science notebooks on teaching and learning. The center that Laurie directs assists a dozen California districts in establishing science programs modeled on the Pasadena Unified School District. A graduate of the University of Southern California, Laurie has been a Pasadena elementary classroom teacher, reading specialist, special resource teacher, and science resource teacher for many years. She works extensively with teachers to implement and disseminate science specific reforms in their districts.

## APPENDIX F

### Acronyms and Abbreviations

| | |
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| ADA | Americans with Disabilities Act |
| AESP | Aerospace Education Services Program (NASA) |
| AMNH | American Museum of Natural History (New York) |
| ASI | Agenzia Spaziale Italiana (Italian Space Agency) |
| ASU | Arizona State University (Tempe) |
| BAWP | Bay Area Writing Project |
| CAPSI | Caltech Pre-college Science Initiative |
| CC | community college |
| CHEPOWG | Cassini–Huygens European Public Outreach Working Group |
| CHSOT | Cassini–Huygens Saturn Observation Team |
| CSSC | Chabot Space and Science Center (Oakland, CA) |
| CSTEA | Center for the Study of Terrestrial and Extraterrestrial Atmospheres |
| CSU | California State University |
| DSN | Deep Space Network |
| EDCATS | Education Division Computer-Aided Tracking System (NASA) |
| E/PO | Education and Public Outreach |
| ERCN | Educator Resource Center Network |
| ESA | European Space Agency |
| FTE | full-time equivalent |
| GAVRT | Goldstone Apple Valley Radio Telescope (California) |
| GSUSA | Girl Scouts of the USA |
| IPS | International Planetarium Society |
| JPL | Jet Propulsion Laboratory |
| KAO | Kuiper Airborne Observatory |
| NACME | National Action Council for Minorities in Engineering |
| NASA | National Aeronautics and Space Administration |
| NCMSC | North Central Mathematics and Science Consortium |
| NCREL | North Central Regional Educational Laboratory |
| NCTM | National Council of Teachers of Mathematics |
| NOBCChE | National Organization for the Professional Advancement of Black Chemists and Chemical Engineers |
| NSBP | National Society of Black Physicists |
| NSF | National Science Foundation |
| NSTA | National Science Teachers Association |
| NYHS | New York Hall of Science |
| OSS | Office of Space Science (NASA HQ) |
| PSG | Project Science Group |
| RTO | Real-time Operations |
| SERCH | South East Regional Clearinghouse |
| SOAP | Satellite Orbit Analysis Program |
| SOI | Saturn orbit insertion |
| SSA | Solar System Ambassadors |
| SSEF | Solar System Exploration Forum |
| URC | University Research Center |